

## A Study of Functional Outcome of Primary Total Hip Arthroplasty in Degenerative Hip Diseases

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### Abstract

**Background:** Degenerative hip diseases cause progressive pain, restriction of movement, and functional disability. Total hip arthroplasty (THA) is an established surgical treatment for advanced disease and aims to relieve pain and restore hip function.

**Objectives:** To evaluate the functional outcome of primary total hip arthroplasty in patients with degenerative hip diseases and to assess postoperative complications.

**Materials and Methods:** This prospective interventional study included 20 patients with degenerative hip diseases undergoing primary THA at S Nijalingappa Medical College, Bagalkot. Patients underwent either uncemented or hybrid THA and were followed at 6 weeks, 3 months, and 6 months. Functional outcome was assessed using range of motion and the Harris Hip Score (HHS). Postoperative complications were also recorded. Data were analyzed using SPSS version 19.0, with  $p < 0.05$  considered statistically significant.

**Results:** Twelve patients (60%) were males and eight (40%) were females. Osteoarthritis was the primary diagnosis in 18 patients (90%). Uncemented THA was performed in 15 (75%) and hybrid THA in five (25%). Hip flexion improved from 83.0° preoperatively to 110.0° postoperatively, with improvement also observed in internal rotation, external rotation, abduction, and adduction. Preoperatively, 19 patients (95%) had poor HHS grades and one (5%) had a fair grade. Postoperatively, 11 patients (55%) had excellent and nine (45%) had good outcomes. There was no significant association between procedure type and postoperative HHS grade ( $p = 0.796$ ). Persistent pain occurred in 25%, superficial wound infection in 10%, and prosthetic dislocation in 5%.

**Conclusion:** Primary THA provided substantial improvement in hip mobility and functional outcome in patients with degenerative hip diseases. Both uncemented and hybrid THA produced satisfactory outcomes, with no significant difference between the procedures in this small cohort.

**Keywords:** Total hip arthroplasty; degenerative hip disease; osteoarthritis; Harris Hip Score; uncemented THA; functional outcome.

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### Introduction

Degenerative diseases of the hip are an important cause of chronic pain, restricted mobility, and functional disability. In advanced disease, progressive destruction of the articular cartilage and alteration of joint anatomy may substantially impair activities of daily living. Total hip arthroplasty (THA) has become an established surgical procedure for patients with severe degenerative hip disease who fail to obtain adequate relief with conservative treatment. Harris introduced a comprehensive clinical scoring system for evaluating pain, function, deformity, and range of motion following hip surgery, which continues

to be widely used for assessment of outcomes after THA. [1] Advances in implant design, bearing surfaces, surgical techniques, and fixation methods have considerably improved the results of primary THA. Both cemented and uncemented components have demonstrated satisfactory clinical outcomes, while hybrid fixation combines different fixation principles according to patient characteristics and bone quality. Wixson et al. reported favorable clinical and radiological outcomes with cemented, uncemented, and hybrid prostheses. [2] Functional assessment is essential for determining the effectiveness of THA. The Harris Hip Score (HHS)

provides a standardized assessment of pain and hip function and has been extensively applied in postoperative outcome studies. [3] THA has also been associated with marked improvement in mobility and health-related quality of life across different age groups. [4,5] Learmonth et al. described total hip replacement as one of the most successful reconstructive procedures because of its ability to relieve pain and restore function in patients with advanced hip disease. [6]

Although the choice between cemented and uncemented fixation continues to depend on patient characteristics, bone quality, implant design, and surgeon preference, both approaches can provide satisfactory outcomes when appropriately selected. [7] Assessment of functional recovery and complications following primary THA is therefore important for evaluating the effectiveness of treatment in different clinical populations.

The present study was undertaken to evaluate the functional outcome of primary total hip arthroplasty in patients with degenerative hip diseases and to assess the associated postoperative complications.

## Materials and Methods

**Study Design and Setting:** This was a prospective interventional study conducted in the Department of Orthopaedics, S Nijalingappa Medical College, and Bagalkot. Patients presenting with degenerative hip disease and radiographic evidence of arthritic changes who fulfilled the eligibility criteria were enrolled in the study.

**Study Duration and Sample Size:** The study was conducted over a period of 18 months, with a total sample size of 20 patients. The sample size was calculated using the formula:

$$[n = \frac{Z^2 pq}{d^2}]$$

Where  $Z = 1.96$  at a 95% confidence level,  $p = 5$ ,  $q = 95$ , and the tolerable error ( $d$ ) was 10%. The calculated sample size was 18.24, which was increased to 20 patients after allowing for approximately 10% attrition.

**Inclusion Criteria:** Patients aged more than 18 years with degenerative hip disease showing arthritic changes on radiographs and considered suitable for primary total hip arthroplasty were included.

**Exclusion Criteria:** Patients who were medically unfit for surgery because of associated comorbidities, those with neuropathic joints, and patients with malignancy requiring revision or other reconstructive surgery were excluded.

**Preoperative Assessment:** All eligible patients underwent detailed clinical and radiological evaluation. A comprehensive history was obtained

regarding hip pain, duration of symptoms, restriction of activities, functional disability, and previous treatment. Clinical examination included assessment of gait, deformity, limb length, tenderness, and range of hip movements.

Routine laboratory investigations included complete blood count, erythrocyte sedimentation rate, C-reactive protein, renal and liver function tests, and coagulation profile. Radiological evaluation included anteroposterior radiographs of the pelvis with both hips and appropriate lateral views. MRI was performed when indicated for further assessment of the underlying pathology.

The severity of hip involvement was assessed clinically and radiologically. The Harris Hip Score (HHS) was recorded preoperatively to establish baseline functional status.

**Preoperative Templating:** Preoperative templating was performed using standard hip radiographs to estimate the appropriate size and position of the acetabular and femoral components. Particular attention was given to restoration of the centre of rotation, femoral offset, limb length, and appropriate component positioning. Templating also assisted in anticipating intraoperative difficulties and selecting suitable implants. (Figure 1, 2&3)

**Surgical Procedure:** All patients underwent primary total hip arthroplasty using a standardized surgical protocol. Depending on patient characteristics, bone quality, and intraoperative findings, either uncemented or hybrid THA was performed. Details regarding the surgical approach, implant type, component position, and intraoperative complications were documented.

After preparation of the acetabulum, an appropriately sized acetabular component was implanted. Femoral preparation was subsequently performed, followed by insertion of the selected femoral component.

Trial reduction was carried out to assess stability, limb length, offset, and range of motion before final implantation. The wound was closed in layers following satisfactory reduction and hemostasis. (Figure 4)

**Postoperative Management:** Postoperatively, patients received appropriate analgesia, antibiotic prophylaxis, thromboprophylaxis, and wound care according to institutional protocol. Rehabilitation was initiated with progressive mobilization, hip range-of-motion exercises, muscle-strengthening exercises, and assisted ambulation. Weight bearing was advanced according to implant fixation, clinical condition, and surgeon assessment.

**Follow-up and Outcome Assessment:** Patients were reviewed at 6 weeks, 3 months, and 6 months

after surgery. At each follow-up, clinical examination, hip range of motion, complications, and functional recovery were documented. Radiographs were evaluated for component position, alignment, fixation, and evidence of implant-related complications. Functional outcome was assessed using the Harris Hip Score, which evaluates pain (44 points), function (47 points), absence of deformity (4 points), and range of

motion (5 points), giving a maximum score of 100. Outcomes were categorized as poor (<70), fair (70–79), good (80–89), and excellent (90–100). [1,3]

The primary outcome was the change in HHS from the preoperative assessment to the final follow-up. Secondary outcomes included improvement in hip range of motion, postoperative complications, radiological findings, and overall functional recovery.



Figure 1: X-ray pelvis of 45 years male showing pre-op and post-op

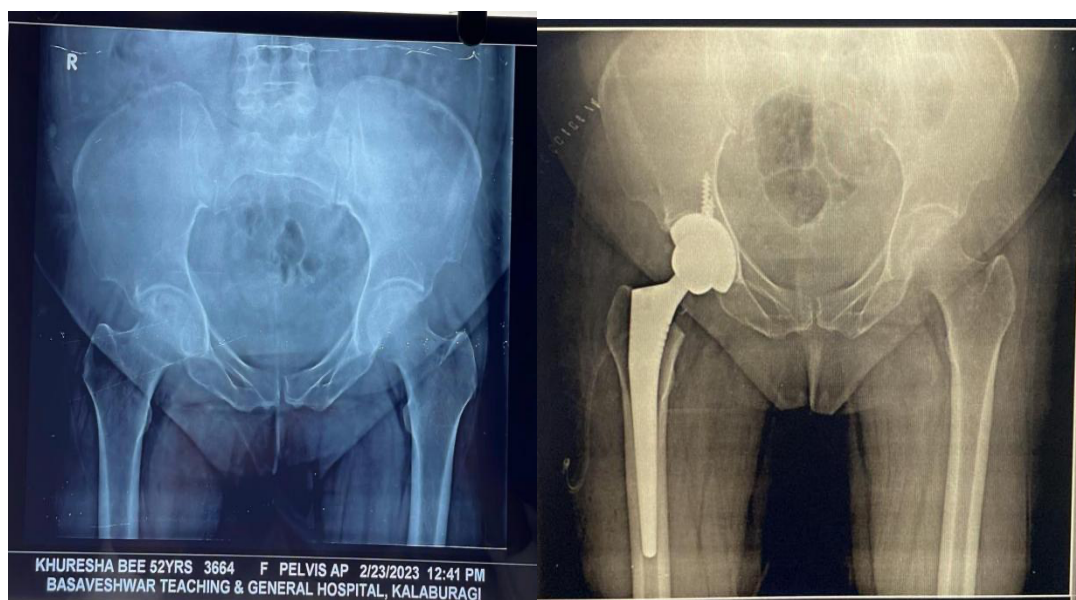


Figure 2: X-ray pelvis of 52 years female showing pre-op and post-op

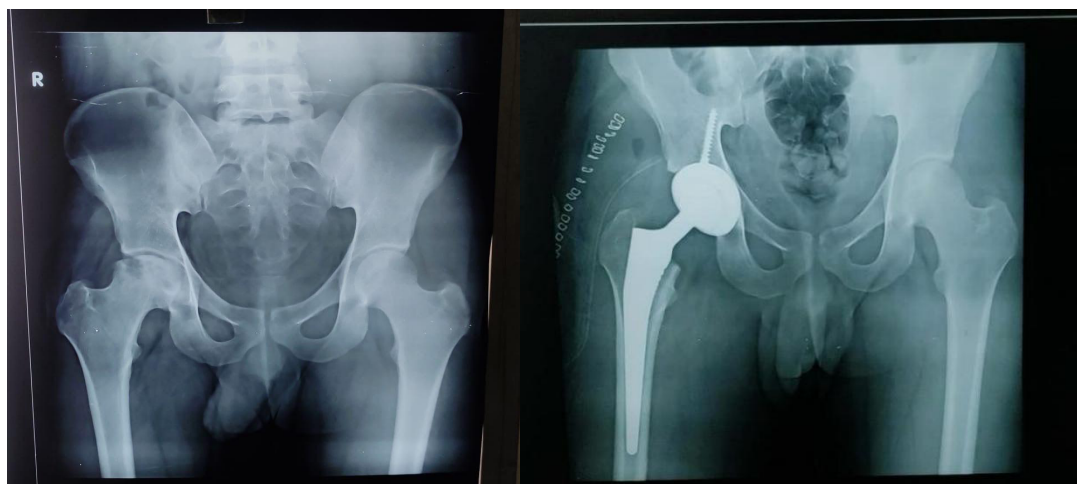


Figure 3: X-ray pelvis of 41 years female showing pre-op and post-op

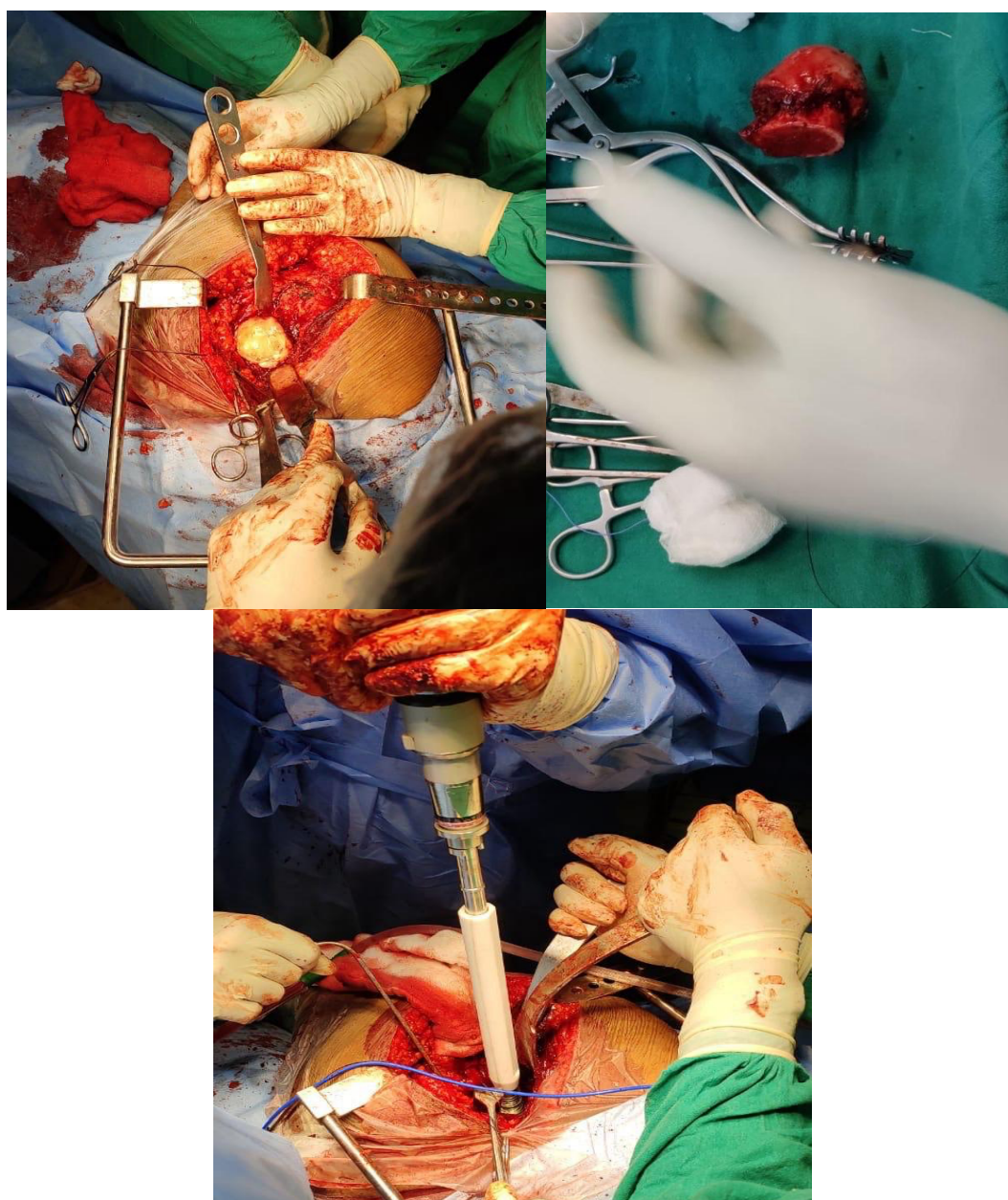


Figure 4: Intraoperative picture

**Statistical Analysis:** Data were entered into Microsoft Excel and analyzed using SPSS version 19.0.

Quantitative variables were expressed as mean  $\pm$  standard deviation, while qualitative variables were presented as frequencies and percentages. Preoperative and postoperative quantitative parameters were compared using the paired Student's t-test. Categorical variables were analyzed using the Chi-square test, wherever appropriate. Comparison of outcomes between uncemented and hybrid THA was performed using suitable parametric or categorical tests according to

the nature of the data. A p-value  $<0.05$  was considered statistically significant.

## Results

A total of 20 patients with degenerative hip diseases underwent primary total hip arthroplasty and were followed for assessment of functional outcome. The majority of patients were aged 41–50 years (50%), 60% were males, and 65% were overweight or obese. Osteoarthritis was the predominant indication for THA, accounting for 90% of cases. Uncemented THA was performed in 15 patients (75%), while five patients (25%) underwent hybrid THA.

**Table 1: Baseline characteristics of the study population**

| Variable          | Category             | n  | Percentage |
|-------------------|----------------------|----|------------|
| Age (years)       | 30–40                | 6  | 30%        |
|                   | 41–50                | 10 | 50%        |
|                   | 51–60                | 4  | 20%        |
| Gender            | Male                 | 12 | 60%        |
|                   | Female               | 8  | 40%        |
| BMI               | Underweight          | 3  | 15%        |
|                   | Normal               | 4  | 20%        |
|                   | Overweight           | 10 | 50%        |
|                   | Obese                | 3  | 15%        |
| Primary diagnosis | Osteoarthritis       | 18 | 90%        |
|                   | Rheumatoid arthritis | 2  | 10%        |
| Procedure         | Uncemented THA       | 15 | 75%        |
|                   | Hybrid THA           | 5  | 25%        |

Half of the study population belonged to the 41–50-year age group, while males constituted 60% of cases. Osteoarthritis was the principal diagnosis in 18 patients (90%). Uncemented THA was the more frequently performed procedure.

**Table 2: Comparison of preoperative and postoperative range of hip movements**

| Range of movement | Preoperative (degrees) | Postoperative (degrees) | Change |
|-------------------|------------------------|-------------------------|--------|
| Internal rotation | 22.7 $\pm$ 6.7         | 36.0 $\pm$ 4.1          | +13.3  |
| Abduction         | 27.7 $\pm$ 6.7         | 41.0 $\pm$ 4.1          | +13.3  |
| External rotation | 27.7 $\pm$ 6.7         | 41.0 $\pm$ 4.1          | +13.3  |
| Adduction         | 18.0 $\pm$ 6.3         | 26.0 $\pm$ 4.1          | +8.0   |
| Flexion           | 83.0 $\pm$ 9.9         | 110.0 $\pm$ 8.2         | +27.0  |
| Extension         | 13.0                   | 13.7                    | +0.7   |

Improvement was observed in all recorded hip movements following surgery. The greatest absolute improvement was noted in flexion, which increased from 83.0° to 110.0°. Internal rotation, external rotation, and abduction also demonstrated marked postoperative improvement, indicating substantial restoration of hip mobility.

**Table 3: Functional outcome according to Harris Hip Score**

| Harris Hip Score grade | Preoperative, n (%) | Postoperative, n (%) |
|------------------------|---------------------|----------------------|
| Poor                   | 19 (95%)            | 0                    |
| Fair                   | 1 (5%)              | 0                    |
| Good                   | 0                   | 9 (45%)              |
| Excellent              | 0                   | 11 (55%)             |
| <b>Total</b>           | <b>20 (100%)</b>    | <b>20 (100%)</b>     |

A marked improvement in functional outcome was observed after THA. Preoperatively, 19 patients (95%) had poor Harris Hip Scores and one patient (5%) had a fair score. At postoperative assessment, 11 patients (55%) achieved excellent outcomes and nine (45%) achieved good outcomes, with no patients remaining in the poor or fair categories. Thus, all patients achieved a good-to-excellent functional result at final assessment.

**Table 4: Postoperative complications and factors associated with functional outcome**

| Parameter                   | Finding          | n (%) / Outcome | p-value |
|-----------------------------|------------------|-----------------|---------|
| Superficial wound infection | Present          | 2 (10%)         | —       |
| Persistent pain             | Present          | 5 (25%)         | —       |
| Prosthetic dislocation      | Present          | 1 (5%)          | —       |
| No complication reported    | Present          | 12 (70%)        | —       |
| <b>Hybrid THA</b>           | Excellent / Good | 3 / 2           | 0.796   |
| <b>Uncemented THA</b>       | Excellent / Good | 8 / 7           |         |
| <b>Osteoarthritis</b>       | Excellent / Good | 11 / 7          | 0.099   |
| <b>Rheumatoid arthritis</b> | Excellent / Good | 0 / 2           |         |

Persistent pain was the most frequently reported postoperative complication, occurring in five patients (25%), followed by superficial wound infection in two (10%) and prosthetic dislocation in one (5%). Twelve patients (70%) were reported to have no complication.

Among patients undergoing uncemented THA, eight achieved excellent and seven achieved good outcomes, while three excellent and two good outcomes were observed after hybrid THA. The association between procedure type and postoperative Harris Hip grade was not statistically significant ( $p=0.796$ ). Similarly, although excellent outcomes were observed exclusively among patients with osteoarthritis, the association between primary diagnosis and functional outcome did not reach statistical significance ( $p=0.099$ ).

Overall, primary THA produced substantial improvement in hip range of motion and Harris Hip Score, with all 20 patients achieving good or excellent functional outcomes at final follow-up. No significant difference in functional outcome was demonstrated between uncemented and hybrid THA.

## Discussion

Total hip arthroplasty is an established treatment for advanced degenerative hip disease and provides substantial improvement in pain, mobility, and overall function. In the present study, 20 patients undergoing primary THA were evaluated, with osteoarthritis being the predominant diagnosis (90%). Uncemented THA was performed in 75% of patients, while 25% underwent hybrid THA. The findings demonstrated considerable improvement in hip range of motion and functional status following surgery.

The Harris Hip Score is widely used for evaluating clinical outcomes following hip arthroplasty, although ceiling effects have been described in patients achieving high levels of postoperative function. Wamper et al. [8] highlighted this limitation while supporting its usefulness for assessment of hip function. In the present study, 95% of patients had poor HHS grades preoperatively, whereas at final follow-up 55% achieved excellent and 45% achieved good

outcomes, demonstrating substantial functional improvement following THA.

Total hip arthroplasty has consistently demonstrated significant benefits in patients with symptomatic osteoarthritis. Grayson and Decker [9] described total joint arthroplasty as an effective intervention for advanced osteoarthritis when conservative treatment no longer provides adequate symptom control. The marked postoperative improvement in range of motion observed in the present study, particularly hip flexion from 83° to 110°, supports the functional benefits of the procedure.

The choice of fixation remains an important consideration in THA. Abdulkarim et al. [10] found that both cemented and uncemented fixation can provide satisfactory outcomes, with the choice influenced by patient and implant-related factors. In our study, 15 patients underwent uncemented THA and five underwent hybrid THA. Although a greater number of excellent and good outcomes occurred in the uncemented group, the association between procedure type and final HHS grade was not statistically significant ( $p=0.796$ ). This finding should be interpreted cautiously because of the small sample size and unequal distribution between the two groups.

Improvement in function following THA can translate into substantial long-term benefit. Pennington et al. [11] demonstrated favorable functional outcomes following primary hip replacement, while Singh et al. [12] emphasized the clinical relevance of improvement in Harris Hip Scores after THA. Similarly, Dimitriou et al. [13] reported considerable gains in quality-adjusted life years following hip arthroplasty. These observations are consistent with the marked transition from predominantly poor preoperative function to entirely good or excellent postoperative outcomes in the present study.

Long-term evidence also supports the durability of modern THA. Evans et al. [14] demonstrated that a substantial proportion of hip replacements remain functional for 20 years or longer. Mei et al. [15] reported favorable long-term outcomes even among patients younger than 55 years, which is particularly relevant to the present population

because most patients were between 30 and 50 years of age.

Postoperative complications remain an important consideration. In the present study, persistent pain was reported in 25%, superficial wound infection in 10%, and prosthetic dislocation in 5%. Despite these complications, functional outcomes remained favorable overall. Kumar et al. [16] demonstrated the usefulness of Harris Hip Score-based assessment following THA in the Indian population and supported its application for evaluating postoperative functional recovery.

Overall, the present study demonstrated substantial improvement in hip function following primary THA for degenerative hip disease. The improvement in range of motion and transition from poor preoperative HHS grades to good-to-excellent postoperative outcomes indicate that THA is an effective procedure for restoring function in appropriately selected patients.

### Conclusion

Primary total hip arthroplasty resulted in marked functional improvement in patients with degenerative hip diseases. Postoperatively, 55% of patients achieved excellent and 45% achieved good Harris Hip Score outcomes, with improvement observed across all measured ranges of hip movement.

Osteoarthritis was the predominant indication, and uncemented THA was the most commonly performed procedure. No statistically significant difference in functional outcome was observed between uncemented and hybrid THA. Persistent pain was the most frequently reported postoperative complication, followed by superficial wound infection and prosthetic dislocation.

Thus, primary THA is an effective surgical option for degenerative hip disease, providing substantial improvement in hip function and mobility with satisfactory short-term functional outcomes.

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