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Research Article

A PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF MANAGEMENT OF ARTHRITIS OF HIP BY TOTAL HIP REPLACEMENT

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Abstract

Background and Objectives: Osteoarthritis (OA) of the hip is a degenerative joint disease that causes wear and tear of the articular cartilage, leading to pain, stiffness, and limited mobility. It is prevalent among middle-aged and elderly adults. Hip OA may be primary or secondary; secondary OA is more common in India. Total hip replacement (THR) is considered the gold-standard treatment for end-stage hip arthritis and other degenerative hip conditions. THR can be classified as cemented, uncemented, or hybrid, based on the use of polymethylmethacrylate (PMMA) cement for prosthesis fixation. The purpose of this study was to evaluate the clinical and functional outcomes of THR using the Modified Harris Hip Score.

Methods: Twenty-five patients undergoing THR in the Department of Orthopaedics, Ballari Medical College and Research Centre (BMCRC), Ballari, between 1 August 2022 and 31 January 2024, were studied prospectively, with follow-up ranging from a minimum of 6 months to a maximum of 18 months.

Results: Functional outcome, assessed using the Modified Harris Hip Score, was excellent in 13 patients (52%), good in 10 patients (40%), and fair in 2 patients (8%); no patient had a poor outcome. There was a significant increase in mean score from 50.32 preoperatively to 88.36 postoperatively among the 25 subjects studied.

Conclusion: Total hip arthroplasty improves the functional ability of patients in terms of gait and range of movement, providing a pain-free, stable, and mobile hip joint. The procedure has tremendously improved the quality of life of patients crippled with chronic arthritis. The Modified Harris Hip Score is an effective scoring system as it incorporates the clinical and functional outcome following total hip arthroplasty.

Keywords: Hip Osteoarthritis; Total Hip Replacement; Modified Harris Hip Score

1. Introduction

1.1 Background

The human hip joint is extremely complex on account of the functional demands placed upon it by the body. Because of its complex biomechanics and important function, a stable, painless hip is required for normal locomotion, and a number of diseases affect the hip joint.

Osteoarthritis (OA) is a degenerative disease that affects the synovial joints and is considered the most common disease of the locomotor system, prevalent among middle-aged and elderly adults. In these populations, a clear relationship between overweight and physical activity has been observed. OA is characterized by focal degeneration of joint cartilage, microfractures, cysts, subchondral bone sclerosis, and osteophyte formation at the articular borders, leading to pain, stiffness, walking difficulty, deformity, and progressive loss of movement in the affected hip. Hip OA may be primary or secondary to previous trauma or to childhood disorders of the hip.[1]

Total hip replacement (THR), also known as total hip arthroplasty (THA), is a common and effective surgical intervention for hip joint pathologies including osteoarthritis, rheumatoid arthritis, and traumatic hip injuries. Advances in surgical technique, implant design, and rehabilitation protocols over recent decades have improved functional outcomes and patient satisfaction. THR is considered the gold-standard treatment for end-stage hip arthritis and other degenerative hip conditions, significantly reducing pain, improving joint function, and enhancing quality of life.[2]

A stable, painless, and mobile hip is required for normal locomotion. Osteoarthritis is currently the most common condition affecting the hip of the adult population, resulting in severe hip pain, restriction of movement, and alteration of day-to-day activities.[3] Rapidly expanding and improving healthcare management has increased longevity, which in turn has increased the occurrence of chronic disabling conditions of the hip such as osteoarthritis.

THR can be divided into cemented, uncemented, or hybrid THR based on the use of PMMA cement for fixation of the prosthesis. For a successful total hip arthroplasty, the prosthesis must be fixed firmly to bone, either with PMMA cement or by bony ingrowth into a porous coating on the implant, resulting in “biologic” fixation.

Historically, the first recorded primary THR was performed by Philip Wiles of London in 1938. The operative technique was further studied and evolved in the 1950s by McKee and Farrar. By applying the biomechanical principles of hip joint function and introducing low-friction arthroplasty, Sir John Charnley revolutionized THR and is regarded as the father of modern total hip arthroplasty.[4]

The Harris Hip Score is a reliable tool for measuring the clinical and functional outcome of THR, assessing pain, functional disability, deformity, and range of movement, pre- and postoperatively.[5]

1.2 Problem Statement

Osteoarthritis of the hip is an increasingly common cause of pain and disability as life expectancy rises, and secondary OA (post-traumatic, post-avascular necrosis) predominates over primary OA in the Indian population. While THR is internationally established as the definitive treatment, prospective, single-centre Indian data quantifying functional recovery — across the cemented, uncemented, and hybrid fixation options actually used in routine practice — using a validated, patient-oriented scoring instrument remain limited. This study was undertaken to prospectively document the clinical and functional outcome of THR performed for hip arthritis in this setting. [Note: this problem-statement framing is the authors' synthesis of the rationale implicit in the thesis Introduction; it is not a verbatim sentence from the source document — see Verification & Assumptions Log.]

1.3 Aim and Objectives

Aim: To evaluate the clinical and functional outcome of management of osteoarthritis of the hip by total hip replacement.

Objectives:

- To evaluate the clinical and functional outcomes of total hip replacement using the Modified Harris Hip Score.
- To perform radiological assessment for evaluation of outcome.

2. Literature Review / Related Work

[Note: The source thesis presents an extensive Review of Literature (pp. 4–37) that combines (a) a historical/clinical evidence review and (b) a textbook-style account of hip anatomy, biomechanics, implant design, and surgical approaches. For a journal-style article, sections 2.2–2.4 below condense that descriptive/background material considerably; section 2.5 reproduces the clinical outcome studies in fuller detail, as these constitute the direct comparators used in the Discussion. See the Verification & Assumptions Log for what was condensed.]

2.1 Historical Evolution of Total Hip Arthroplasty

The evolution of hip arthroplasty progressed through osteotomy arthroplasty, interposition arthroplasty, reconstructive arthroplasty, femoral replacement arthroplasty, and finally total hip arthroplasty.

The earliest recorded attempts at hip replacement occurred in Germany in 1891, when Professor Themistocles Gluck presented the use of ivory to replace femoral heads destroyed by tuberculosis; surgeons subsequently experimented with interposition arthroplasty using fascia lata, skin, and pig bladder submucosa.[6] Smith-Petersen of Boston trialled glass cups in 1923 and Bakelite thereafter, achieving success 15 years later with cups made of vitallium.[7] The hemiarthroplasty of the Judet brothers[8] and, in 1953, Philip Wiles' implantation of matched stainless-steel acetabular and femoral components in six patients[9] provided early experience with reconstructive hip surgery. All-metal combinations were subsequently introduced by McKee and Farrar and by Ring in England, and by Haboush, Urist, and McBride in the United States[10], though results were limited by component loosening.

It was John Charnley who established THR as a widely useful procedure through his concept of low-friction arthroplasty[11], reducing the femoral head diameter to 22 mm and, after early failure with Teflon, adopting high-molecular-weight polyethylene and PMMA cement.[12] Subsequent refinements included low-viscosity cement[13], pressurized cementing technique[14], improved cementing methods[15], and cementless, porous-coated femoral components enabling biologic fixation.[16]

A timeline of milestones in hip arthroplasty, drawn from the thesis, spans ivory hemiarthroplasty (Gluck, 1890), rubber (Deblt, 1919), glass (Smith-Petersen, 1925), Pyrex (1933), vitallium (1936), Bakelite (1939), long-stemmed vitallium hemiarthroplasty (Bohlman and Austin T. Moore, late 1930s), the stemmed prosthesis of the Judet brothers (1938–46), long-stemmed prostheses by Thompson and Moore (1950s), McKee-Farrar total hip arthroplasty (1951), the Gaenslen acetabular cup (1952), Charnley's Teflon (1958) and PMMA (1961) low-friction arthroplasty, Boutin's alumina-on-alumina ceramic implant (1970), McKee-Farrar cobalt-chromium-molybdenum alloy (1973–76), tribological developments (1980s), new ceramic-on-ceramic designs (1990s), Sedel's alumina ceramic-on-ceramic (1992), Fisher's work on wear-debris reduction (1994), Muller's cobalt-chrome pairings (1995), and growing interest in hydroxyapatite-coated porous surfaces (2000s).

2.2 Relevant Anatomy and Biomechanics of the Hip

The hip is a ball-and-socket diarthrodial joint permitting flexion/extension, abduction/adduction, and internal/external rotation, linking the axial skeleton to the lower limb. The acetabulum is formed by fusion of the ilium, ischium, and pubis; the femoral head, forming three-quarters of a sphere, is stabilized by the fibrous capsule, iliofemoral (Bigelow), pubofemoral, and ischiofemoral ligaments, and the ligamentum teres. The femoral neck-shaft angle is 120–130° with 15–20° of anteversion.

Blood supply to the femoral head derives from an extracapsular arterial ring at the base of the femoral neck, its ascending cervical branches, and the artery of the ligamentum teres, formed by anastomoses of the obturator, medial and lateral circumflex femoral, and superior and inferior gluteal arteries.[28]

Biomechanically, implanted components are subjected to repeated bending, compressive, torsional, and hoop stresses from cyclic loading of three to five times body weight (up to ten times during running or jumping); the joint reaction force equals body weight plus abductor force, and Charnley's concept of deepening the acetabulum and lateralizing the greater trochanter reduces this load.[29] Restoration of vertical height, medial offset, and femoral version at reconstruction is essential to normal biomechanics and implant longevity.[30,31]

2.3 Implant Design, Fixation, and Bearing Surfaces

Implants are classified by fixation method (cemented or uncemented) and bearing surface (metal-on-polyethylene, ceramic-on-ceramic, ceramic-on-polyethylene, or ceramic-on-metal).[36] Conventional ultra-high-molecular-weight polyethylene (UHMWPE) performs well but generates wear debris causing osteolysis; highly cross-linked polyethylene (XLPE) has markedly improved wear properties. Metal-on-metal bearings (cobalt-chromium alloys) offered low dislocation rates but were later found to cause adverse local tissue reactions and elevated systemic metal-ion levels.

Ceramic-on-ceramic bearings offer low wear and high mechanical strength but have historically been associated with liner fracture, squeaking, and impingement, issues that have been substantially resolved in modern ceramics.[37] Cement fixation, using third-generation techniques (cement restrictors, vacuum mixing, pressurization, pulsatile lavage), remains the gold standard for the femoral and acetabular sides since Charnley's original work[38], while cementless fixation achieves osseointegration through press-fit stability and subsequent bone in-growth over four to twelve weeks.[39] Hybrid constructs (cemented femoral stem with cementless acetabular cup) have shown better survivorship than fully cemented sockets in younger patients in Norwegian registry data.[40]

2.4 Surgical Approaches

Anterior, anterolateral (Watson-Jones), and transtrochanteric (Charnley) approaches provide comparatively limited exposure for the amount of soft-tissue release required. The two approaches most commonly used worldwide, and used in this study, are the transgluteal Hardinge (lateral) approach and the posterior (Southern Moore) approach; the former divides the conjoined tendon over the greater trochanter, while the latter splits the gluteus maximus and divides the short external rotators, preserving the abductor mechanism.

2.5 Prior Clinical Outcome Studies

Davey and Harris conducted a clinical and radiographic study of 52 primary total hip arthroplasties (1982–84; mean follow-up 31 months; mean age 55 years), with osteoarthritis, congenital dislocation of the hip, avascular necrosis, and rheumatoid arthritis as the leading indications; 50 hips were rated good or excellent, one fair, and one poor.[17]

Wixson, Stulburg, and Mehlhoff compared cemented, uncemented, and hybrid prostheses in 144 hips (1991) and found similar overall clinical results across the three groups, with mean total Harris hip scores of 91 (cemented), 90 (hybrid), and 95 points (bone in-growth in both components).[18]

Goldberg et al. followed 125 hybrid THAs in 120 patients for 7–11 years (mean age 71 years); the average Harris Hip Score rose from 37 points preoperatively to 92 points at final follow-up, with minimal polyethylene wear and no more than 1 mm of cup migration.[19]

Callaghan et al. followed 131 primary hybrid THAs (118 patients, primary osteoarthritis) for 8–9 years; 92.7% of hips were pain-free, 85.5% required no ambulatory support, and 96% of patients rated the outcome satisfactory at latest follow-up.[20]

Dhaon et al. evaluated hybrid THR outcomes across various hip disorders and concluded that, in properly selected cases, hybrid THA offers a better alternative than other available procedures.[21]

Siwach et al. performed a retrospective study of total hip replacement supporting continued use of the modular hip system, noting that acetabular loosening was more common than femoral loosening.[22]

Kumar P et al. evaluated 118 hips (99 patients) managed by primary THR using the Harris Hip Score in a retrospective study (mean age 43.2 years; male-to-female ratio 3.1:1; mean follow-up 1.6 years); avascular necrosis (50 hips) and post-traumatic sequelae (36 hips) were the leading indications, and the mean postoperative Harris Hip Score was 81.41.[23]

Lakhotia and Agrawal evaluated functional outcomes and complications of THR among patients of low socioeconomic status in India using a modified Harris Hip Score (with range-of-motion and deformity items replaced by items on return to professional and sexual activity); the score improved from a preoperative mean of 13.28 to a postoperative mean of 88.52 ($p < 0.001$), with 64% of patients returning to their original profession.[24]

Götz et al. compared an Enhanced Recovery After Surgery (ERAS) pathway with a conventional setup in 194 patients undergoing THA in a single-blinded randomized controlled trial, demonstrating excellent outcomes with comparable pain relief for the ERAS pathway.[25]

3. Methodology

3.1 Study Design and Setting

This was a prospective study carried out on 25 patients undergoing total hip replacement in the Department of Orthopaedics, Ballari Medical College and Research Centre (BMCRC), Ballari, Karnataka, between 1 August 2022 and 31 January 2024. Patient information was compiled from clinical details, case files, and operation theatre records. Follow-up ranged from a minimum of 6 months to a maximum of 18 months. Ethical clearance was obtained from the Institutional Ethics Committee, Vijayanagar Institute of Medical Sciences, Ballari (Approval No. 26/PG Thesis/2021-22, dated 16 January 2023).

3.2 Inclusion and Exclusion Criteria

Inclusion criterion:

- Patients presenting to the Department of Orthopaedics, BMCRC, Ballari, with osteoarthritis of the hip (including post-traumatic osteoarthritis), aged > 50 years.

Exclusion criteria:

- Age of patient < 50 years.
- Patients with congenital hip pathologies.
- Patients with active infection of the hip.

3.3 Preoperative Assessment and Planning

On admission, a detailed history was recorded per a structured proforma and patients underwent clinical examination. Routine investigations (complete blood count, renal function tests, blood grouping, serum electrolytes, HIV, HBsAg, HCV) and urine, skin, throat, and blood cultures were performed; surgery was deferred if results were abnormal.

Standard anteroposterior and lateral radiographs of the pelvis with both hips were obtained.

Patients were evaluated using the Modified Harris Hip Score (pain, function, range of motion, and deformity), with limb-length discrepancy and flexion deformity separately noted. Physical fitness and neurovascular status were assessed, and occult infections (skin lesions, dental caries, urinary tract infection) were identified and treated preoperatively.

Radiographic evaluation used an anteroposterior pelvic view with both hips and the upper femur in 15° of internal rotation, plus a lateral hip view, assessing femoral bone stock, medullary cavity, limb-length discrepancy, and neck, and acetabular bone stock, floor, migration, protrusion, osteophytes, and approximate cup size. Preoperative templating determined implant type and size and aimed to restore the anatomical and biomechanical centre of rotation of the hip, with appropriately sized components kept ready. Tetanus toxoid and a lignocaine sensitivity test were administered prior to surgery, and antibiotic prophylaxis was given one hour preoperatively in all cases.

3.4 Surgical Procedure

Surgeries were performed electively under standard aseptic precautions, using spinal or epidural anaesthesia, by different surgeons. Patients were positioned laterally on the unaffected side; the operative skin was scrubbed with povidone-iodine and the limb draped separately from groin to toes. The approach used was either the posterior approach (a modification of Gibson's and Moore's approach) or the lateral (Hardinge) approach, at the operating surgeon's discretion. All three fixation types — cemented, uncemented, and hybrid — were performed in this series.

After exposure and capsulotomy, the femoral head was dislocated (anteriorly for the lateral approach, posteriorly for the posterior approach) and the neck osteotomized at the pre-planned level; vertical offset was checked against templating. The acetabulum was exposed, all osteophytes and the ligamentum teres excised, and reaming continued to bleeding subchondral bone while preserving the roof as far as possible. The femur was prepared with sequential rasps. Trial components were inserted and reduced to confirm range of motion, stability, and limb-length correction.

For cemented THR, cement was inserted at the doughy stage; the femoral canal was plugged, irrigated, and pressurized, with the stem impacted in the predetermined position and anteversion before hip reduction after cement polymerization. For uncemented THR, the acetabular cup (one size larger than the last reamer) was press-fit and, where used, secured with screws in the postero-superior quadrant to avoid neurovascular injury; the femoral canal was hand-reamed to the templated stem size, and stem stability was checked against rotational and extraction forces before insertion of the prosthetic head. Closure in both techniques involved reattachment of the short external rotators through drill holes in the posterior greater trochanter, layered closure of fascia, subcutaneous tissue, and skin, and insertion of a suction drain.

3.5 Postoperative Protocol and Follow-up

The hip was positioned in approximately 15° of abduction during recovery, with an immediate postoperative radiograph to check implant position. On postoperative day 1, patients were taught static quadriceps, knee, and ankle mobilization exercises and assisted to sit. On day 2, dressings were changed and walker-assisted gait training with weight-bearing to tolerance was begun; drains were removed at 24–48 hours. Intravenous antibiotics were given for 48–72 hours, followed by oral antibiotics for a further 5 days; DVT prophylaxis with low-molecular-weight heparin was given for the first 5 postoperative days. Sutures were removed on postoperative day 12 and patients discharged with review scheduled after 6 weeks, and advised against squatting, cross-legged sitting, use of Indian (squat) toilets, and crossing the operated limb across the midline.

Patients were followed up at 6 weeks, 3 months, 6 months, and 1 year. [Note: the thesis Materials and Methods section states overall follow-up ranged from 6 to 18 months, while the Follow-up subsection separately states a minimum of 6 months and maximum of 1 year — this minor internal inconsistency in the source document is reproduced here rather than resolved; see Verification & Assumptions Log.]

3.6 Outcome Assessment Instrument

Clinical and functional outcomes were evaluated using the Modified Harris Hip Score (mHHS), in which clinician-reported items of the original Harris Hip Score (range of motion and limb-length discrepancy) are removed, yielding a valid, fully patient-reported instrument. The original Harris Hip Score allocates a maximum of 100 points across pain (44), function (47), range of motion (5), and absence of deformity (4). Results were graded as excellent (90–100), good (80–89), fair (70–79), and poor (< 70).

3.7 Radiological Assessment

A radiograph was obtained at the end of the procedure and at each follow-up visit, comprising an anteroposterior view of the pelvis with both hips and sufficient femoral length. Assessment included component positioning and alignment and complications such as periprosthetic fracture. Cup inclination was measured against a reference line through the base of both teardrops. Cups without a radiolucent line ≥ 1 mm in width and without migration were considered to show stable fibrous union; those with progressive radiolucent lines or migration were considered loose. Radiographic osteolysis was defined as punched-out areas devoid of trabecular bone, usually with a sclerotic border.

3.8 Sample Size Estimation

Sample size was estimated using the formula $N = Z^2_{1-\alpha/2} \times P(1-P) / d^2$ (Patrikar S. In: Bhalwar R, editor. Textbook of Community Medicine, 1st ed., 2009. Department of Community Medicine, AFMC Pune; publisher: WHO India Office, New Delhi), with the good-to-excellent outcome incidence (94%) from Wade and Shah's study of functional and radiological outcome of uncemented THA in young adults used as the reference proportion.

Parameter	Value
P — population proportion (guess)	0.94
1−α — confidence level	0.95
Z — Z-value for confidence level	1.959963985
E — absolute precision	0.094
N — minimum sample size	25

Table (Methodology). Sample size calculation (source: thesis, Sample Size Calculation, p. 50).

Applying the formula yielded a minimum required sample size of 25, which was the number of patients enrolled.

3.9 Statistical Analysis

Data were entered into MS Excel and analysed using SPSS (versions cited in the thesis as 24.0 in Methods and 21 in Results — both figures are reproduced from the source without reconciliation; see Verification & Assumptions Log). The Shapiro-Wilk test was used to check normality of the data; as the data were normally distributed, bivariate analysis used the independent t-test, and comparison of categorical variables used the chi-square test. Preoperative and postoperative Modified Harris Hip Scores were compared using the Wilcoxon Matched-Pairs Signed-Rank Test. Qualitative data were expressed as proportions and quantitative data as mean and standard deviation; associations between qualitative variables were assessed with the chi-square or Fisher's exact test; paired t-tests compared means within groups and unpaired t-tests compared means between groups. A p-value < 0.05 was considered statistically significant and < 0.001 highly significant.

4. Results and Findings

This study included a total of 25 patients with diseased hips treated by total hip replacement between 1 August 2022 and 31 January 2024 at BMCRC, Ballari. Follow-up ranged from a minimum of 6 months to a maximum of 18 months. Results were analysed both clinically and radiologically.

4.1 Demographic and Clinical Characteristics

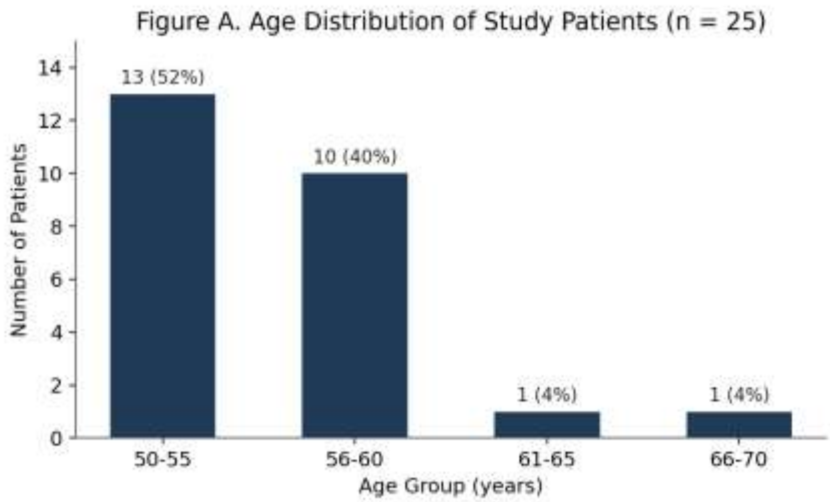

Figure A. Age distribution of the 25 study patients (source: thesis Table 1 / Graph 1, p. 53).

Of the 25 patients, 13 (52%) were aged 50–55 years, 10 (40%) were aged 56–60 years, 1 (4%) was aged 61–65 years, and 1 (4%) was aged 66–70 years. Eighteen patients (72%) were male and 7 (28%) female, a male-to-female ratio of approximately 2.5:1. Fourteen patients (56%) had right-sided hip arthritis and 11 (44%) left-sided. The most common indication for surgery was osteoarthritis secondary to avascular necrosis (AVN) in 15 patients (60%), followed by post-traumatic osteoarthritis in 9 patients (36%) and primary osteoarthritis in 1 patient (4%).

Characteristic	n (of 25)	%
Age 50–55 years	13	52%
Age 56–60 years	10	40%
Age 61–65 years	1	4%
Age 66–70 years	1	4%
Male	18	72%
Female	7	28%
Right side affected	14	56%
Left side affected	11	44%
Indication: Primary OA	1	4%
Indication: Post-traumatic OA	9	36%
Indication: OA secondary to AVN	15	60%

Table 1. Summary of demographic and clinical characteristics of study patients (source: thesis Tables 1–4, pp. 53–56).

4.2 Type of Total Hip Replacement Performed

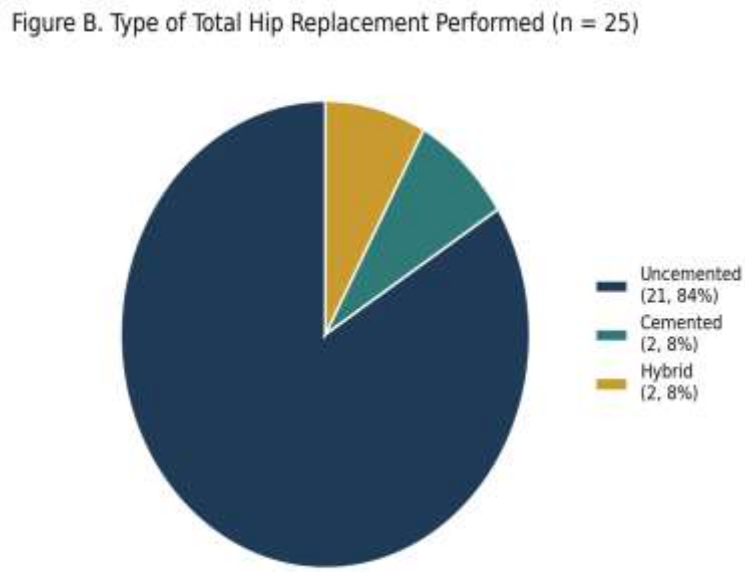

Figure B. Type of total hip replacement performed (source: thesis Table 5 / Graph 5, pp. 56–57).

Of the 25 total hip replacements performed, 21 (84%) were uncemented, 2 (8%) were cemented, and 2 (8%) were hybrid.

4.3 Complications

One patient (4%) developed sciatic nerve neuropraxia attributed to excessive intraoperative retraction of the nerve; this was managed with passive dorsiflexion and plantarflexion exercises, with weight-bearing delayed, and the patient recovered within 6 weeks. One patient (4%) developed a surgical site infection, treated with intravenous antibiotics following culture and sensitivity testing. One patient (4%) sustained an intraoperative femoral fracture: a pre-existing crack of the lesser trochanter progressed to a complete fracture during surgery, treated with cerclage wiring, with weight-bearing again delayed. No other complications were noted during the study period, and there were no dislocations.

Complication	n (of 25)	%
Sciatic nerve neuropraxia	1	4%
Surgical site infection	1	4%
Intraoperative femoral fracture	1	4%

Table (Results). Postoperative complications (source: thesis Table 6, p. 58).

4.4 Functional Outcome: Modified Harris Hip Score

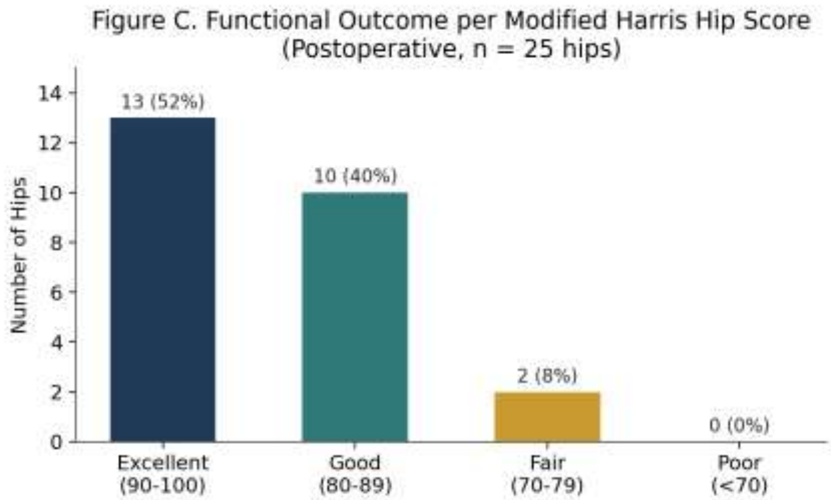

Figure C. Distribution of postoperative functional outcome per the Modified Harris Hip Score (source: thesis Table 7 / Graph 7, pp. 59–60).

Functional outcome was excellent in 13 patients (52%), good in 10 patients (40%), and fair in 2 patients (8%); no patient had a poor outcome.

Preoperatively, marked pain was present in 52% of patients, moderate pain in 36%, and mild pain in 12%; at the latest follow-up, 88% of patients had no pain, and only 12% had moderate-to-mild pain requiring analgesics. All patients (100%) had a limp preoperatively; postoperatively, only 12% had a moderate limp, with 88% having slight or no limp. All patients (100%) required a walking aid preoperatively, compared with only 12% postoperatively (88% required no or occasional support). Preoperatively most patients were restricted to indoor activity or bed; postoperatively, 88% could walk long distances, with only 12% restricted to under 500 metres.

4.5 Statistical Comparison of Preoperative and Postoperative Scores

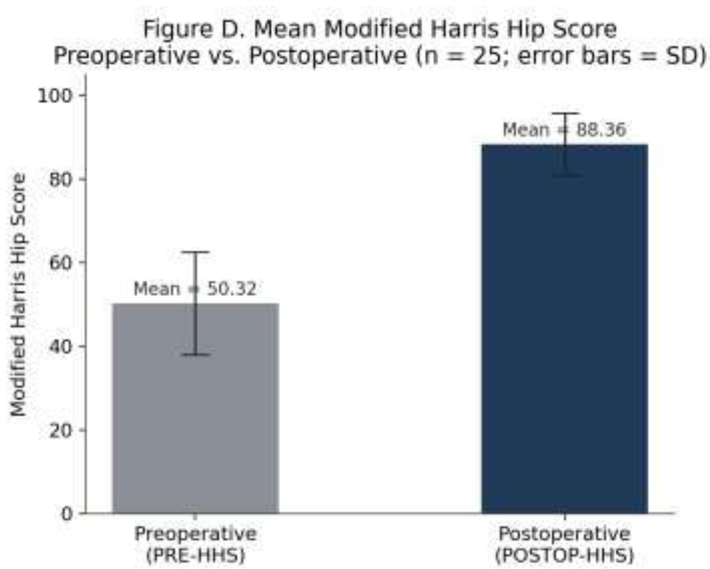

Figure D. Mean Modified Harris Hip Score, preoperative versus postoperative, with standard deviation error bars (source: thesis Table 8, p. 60).

Time point	Min	Max	Mean	SD	25th %ile	Median	75th %ile
Preoperative (PRE-HHS)	36.00	62.00	50.32	12.243	47.00	53.00	57.00
Postoperative (POSTOP-HHS)	74.00	95.00	88.36	7.421	87.00	90.00	91.00

Table 2. Descriptive statistics of Modified Harris Hip Score, preoperative vs. postoperative (n = 25) (source: thesis Table 8, p. 60).

The Wilcoxon Signed-Rank Test showed a significant increase in scores from a preoperative mean of 50.32 to a postoperative mean of 88.36 among the 25 subjects studied. All 25 paired comparisons showed a positive rank (postoperative score higher than preoperative), with 0 negative ranks and 0 ties (mean rank 13.00, sum of ranks 325.00); $Z = -4.375$, $p < .001$ (asymptotic 2-tailed significance = .000).

4.6 Radiographic Results

At the last follow-up, radiographs showed no evidence of cup migration or prosthesis loosening, no new radiolucency, and no shift in the position of any femoral component. In cemented and hybrid THR, no radiolucent lines were seen at the bone-cement-prosthesis interface, and there were no fractures or cracks in the cement mantle.

5. Discussion

Osteoarthritis of the hip is a degenerative joint disease causing wear and tear of the articular cartilage, leading to pain, stiffness, and limited mobility, and is prevalent among middle-aged and elderly adults. Hip OA can be primary or secondary, with secondary OA more common in India. Total hip replacement is considered the gold-standard treatment for end-stage hip arthritis and other degenerative hip conditions, significantly reducing pain, improving joint function, and enhancing quality of life. THR can be cemented, uncemented, or hybrid.

In the present study, the majority of patients (23 of 25, 92%) were aged 50–60 years, with 2 patients above 60 years, and males predominated. In the study by Kumar P et al., the mean age was below 50 years[23], and, as in the present study, males outnumbered females; in their series patients were typically operated on in the fifth decade, whereas in the present series the procedure was deferred as long as possible, with all patients operated on after age 50. Similarly, Dhaon et al.[21] reported a male preponderance with a ratio of 3:1, comparable to the 2.5:1 ratio observed here. Siwach et al.[22] studied 100 patients of a similar age profile (mostly above 50 years) but, unlike the present series, had an equal number of males and females. In some series the average age was as high as 68 years.

The most common cause of osteoarthritis in this study was avascular necrosis (15 patients, 60%), consistent with the findings of Kumar P et al.[23], Siwach et al.[22], and Lakhotia and Agrawal.[24]

Although these patients often presented at a younger age, surgery was delayed as long as possible with weight-reduction advice and oral medication.

The majority of cases in this study were treated with an uncemented prosthesis (21 cases, 84%), whereas a comparable study using cemented, uncemented, and hybrid fixation[18] reported an almost equal split between cemented and uncemented THR, unlike the present series, which used relatively few cemented and hybrid cases.

Both the Hardinge lateral and posterior Moore approaches were used in this study, in contrast to Siwach et al.[22] and Dhaon et al.[21], who used only the Hardinge lateral approach, and Lakhotia and Agrawal[24], who used only the posterior Moore approach; in the present series, different surgeons had different preferences for approaching the hip.

Complications in this series were limited to one case of sciatic nerve neuropraxia due to excessive intraoperative retraction, one superficial surgical site infection that responded to intravenous antibiotics, and one intraoperative femoral fracture (a pre-existing crack of the lesser trochanter that progressed to complete fracture during surgery), treated with cerclage wiring and delayed weight-bearing. There were no dislocations in this series; postoperative DVT prophylaxis with low-molecular-weight heparin may have contributed to the absence of thromboembolic events.

By comparison, a study by Goldberg et al.[19] reported 3 dislocations and 3 cases of deep vein thrombosis postoperatively. [Note: this figure is reproduced as stated in the thesis Discussion; the thesis Review of Literature summary of the same reference (Goldberg et al.) does not itself state these dislocation/DVT figures, so this reflects an internal inconsistency in the source document rather than an error introduced here — see Verification & Assumptions Log.]

The present study showed excellent-to-good outcomes in 92% of patients and fair outcomes in 8%, comparable to the outcomes reported by Wixson et al.,[18] Siwach et al.,[22] Lakhotia and Agrawal,[24] and Dhaon et al.[21]

Overall, total hip replacement provided a stable, painless, and mobile hip in patients affected by hip osteoarthritis who had previously experienced chronic pain, restriction of movement, and disruption of day-to-day activities.

6. Conclusion and Future Work

This study evaluated total hip arthroplasty for arthritis of the hip using cemented, uncemented, and hybrid THR in 25 patients (2 cemented, 2 hybrid, 21 uncemented). Total hip arthroplasty improved functional ability in terms of gait and range of movement, providing a pain-free, stable, and mobile hip joint, and substantially improved the quality of life of patients disabled by chronic arthritis.

Careful patient selection, together with pre- and postoperative evaluation of both patients and radiographs, is essential to the success of total hip arthroplasty. The Modified Harris Hip Score proved an effective scoring system, incorporating both clinical and functional outcomes following total hip arthroplasty. Although the study was not free of complications, the overall functional outcome was excellent.

Because of the short study period and limited number of patients, late complications could not be evaluated. A longer study with a larger sample is required to draw more definitive conclusions and to assess long-term implant survivorship and late complication rates.

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