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Original Research Article

Direct Anterior Approach in Total Hip Arthroplasty

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Abstract:

Background: For end-stage hip arthritis, total hip arthroplasty (THA) is a commonly used surgical method that significantly reduces pain and increases range of motion. The direct anterior approach (DAA) has become more well-liked because of its possible advantages, which include shorter recovery times, less soft tissue damage, and decreased blood loss. The aim of this study was to evaluate DAA's effects in THA. The study investigated the results of THA using the straight anterior approach.

Method: A study with a retrospective cohort was carried out. There were 200 patients in all who had THA with DAA. Patients with diagnoses of THA-requiring diseases, such as rheumatoid arthritis, osteoarthritis, or avascular necrosis, who were at least eighteen years old, met the inclusion criteria. Individuals with serious comorbidities or history of hip surgery were not accepted. SPSS version 25.0 was used to gather and analyse data on patient features, intra-operative variables, and post-operative outcomes.

Results: 55% of the participants were male and 45% were female, with a mean age of 65.3 ± 8.7 years. The most typical preoperative diagnosis (60%) was osteoarthritis. There was an average blood loss of 200.5 ± 50.6 ml and a mean surgery time of 95.4 ± 15.3 minutes. Day 1 mean postoperative pain scores dropped to 1.5 on day 7 ($p < 0.001$), a substantial reduction. The average hospital stay lasted for 4.8 +/- 1.2 days. 10% of the cases resulted in complications overall, with wound infections accounting for 4% of cases.

Conclusions: The direct anterior approach in THA resulted in significant pain reduction and acceptable complication rates. These outcomes suggest that DAA is a viable and effective option for THA, offering quick recovery and manageable safety profiles.

Recommendations: Future studies should focus on long-term outcomes and comparisons with other surgical approaches to validate these findings further. Training programs for surgeons on DAA could enhance its adoption and improve patient outcomes.

Keywords: Total Hip Arthroplasty, Direct Anterior Approach, Pain Reduction, Postoperative Complications, Surgical Outcomes

Introduction

Total hip arthroplasty (THA) is a widely accepted surgical treatment for end-stage hip arthritis, offering considerable pain relief and improved mobility for millions of patients worldwide. Over the years, various approaches have been developed to perform THA, each with its own advantages and disadvantages [1]. The direct anterior approach (DAA) is a relatively newer technique that has gained popularity due to its potential benefits, including reduced blood loss, less soft tissue trauma, and faster recovery times.

The DAA involves an anterior incision, typically between the anterior superior iliac spine and the pubic symphysis, allowing for direct access to the hip joint. This approach avoids the need for retracting the gluteus medius and minimizes the risk of nerve damage, which can be significant with traditional lateral or posterior approaches [2]. Additionally, the DAA enables the surgeon to maintain a clear line of sight to the hip joint, facilitating precise implant placement and reducing the risk of complications such as dislocation and instability [3].

Several studies have demonstrated the efficacy and safety of the DAA in THA. A systematic review of 15 studies found that the DAA was related with lower rates of complications, including infection, wound complications, and nerve damage, compared to traditional approaches [4, 5]. Another study reported that patients undergoing DAA THA experienced significantly less pain and improved functional outcomes compared to those undergoing posterior THA [6].

Despite these benefits, the DAA is not without its challenges. The approach requires significant surgical expertise and may be more technically demanding than traditional approaches, particularly for surgeons with limited experience. Additionally, the DAA may not be suitable for all patients, particularly those with significant soft tissue contractures or anatomical abnormalities.

The study was investigated the outcomes of the direct anterior approach in total hip arthroplasty.

Methodology

Study Design

A retrospective cohort study.

Study Setting

The study was carried out at Jawahar Lal Nehru Medical College and Hospital, Bhagalpur, Bihar, India, from June 2023 to May 2024.

Participants

A total of 200 patients were comprised in the study.

Inclusion Criteria

- Individuals aged 18 years and older.
- Patients diagnosed with conditions requiring total hip arthroplasty, such as rheumatoid arthritis, osteoarthritis, or avascular necrosis.

Exclusion Criteria

- Patients with previous hip surgeries.
- Patients with severe comorbidities that could affect the surgical outcome.

Bias

Selection bias was minimized by including consecutive patients who met the inclusion criteria. Observer bias was reduced by having data collected and analyzed by independent researchers not involved in the surgical procedures.

Variables

The primary variables included patient demographics, preoperative diagnosis, intraoperative parameters, and postoperative outcomes.

Sample size:

To calculate the sample size for this study, the following formula was used for estimating a proportion in a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:
- n = sample size
- Z = Z-score corresponding to the desired level of confidence
- p = estimated proportion in the population
- E = margin of error

Data Collection

Data were gathered from participants medical records, including preoperative assessments, intraoperative notes, and postoperative follow-up visits. A standardized data collection form was used to ensure consistency.

Procedure

The direct anterior technique was used to perform THA on the patients. A comprehensive evaluation of the patient's medical records, a physical examination, and diagnostic imaging were all part of the preoperative planning process. The surgery was performed under general or spinal anesthesia. Postoperative care included pain management, physical therapy, and regular follow-up visits to monitor recovery and detect any complications.

Statistical Analysis

The clinical features and patient demographics were compiled using descriptive statistics. The variables were displayed as percentages, frequencies, and mean ± standard deviation. Statistical significance was attained when the p-value was less than 0.05. SPSS version 25.0 was utilised for conducting statistical analysis.

Ethical considerations:

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

Result

Two hundred patients who had THA via the direct anterior method were comprised in the study. The patients' average age was 65.3 ± 8.7 years. Ninety ladies (45%) and 110 males (55%) were present. Osteoarthritis was the most prevalent preoperative diagnosis (60%) and was followed by rheumatoid arthritis (15%) and avascular necrosis (25%).

Table 1: Clinical Features and Patient Demographics

Characteristic	Value
Number of patients	200
Mean age (years)	65.3 ± 8.7
Gender	
Male	110 (55%)
Female	90 (45%)
Preoperative diagnosis	
- Osteoarthritis	120 (60%)
- Avascular necrosis	50 (25%)
- Rheumatoid arthritis	30 (15%)

The mean surgical time was 95.4 ± 15.3 minutes, and the mean blood loss was 200.5 ± 50.6 ml.

Table 2: Intraoperative Parameters

Parameter	Value
Mean surgical time (min)	95.4 ± 15.3
Mean blood loss (ml)	200.5 ± 50.6

The mean pain score on the Visual Analog Scale (VAS) on post-operative day 1 was 4.2 ± 1.1, which significantly decreased to 1.5 ± 0.7 by postoperative day 7 ($p < 0.001$). The mean length of hospital stay was 4.8 ± 1.2 days. There were no substantial variations in pain scores or hospital stay duration between males and females.

Table 3: Post-operative Pain Scores and Length of Hospital Stay

Parameter	Value
Mean VAS pain score (Day 1)	4.2 ± 1.1
Mean VAS pain score (Day 7)	1.5 ± 0.7
Mean length of hospital stay (days)	4.8 ± 1.2

The overall complication rate was 10%. The most common complication was wound infection, occurring in 4% of patients. Other complications included dislocation (3%), deep vein thrombosis (2%), and nerve injury (1%).

Table 4: Postoperative Complications

Complication	Number of Patients	Percentage (%)
Wound infection	8	4%
Dislocation	6	3%
Deep vein thrombosis	4	2%
Nerve injury	2	1%
Total complications	20	10%

There were significant improvements in postoperative pain scores from day 1 to day 7 ($p < 0.001$). The complication rates did not significantly differ by age, gender, or preoperative diagnosis.

Table 5: Statistical Analysis of Postoperative Pain Scores

Time Point	Mean VAS Pain Score ± SD
Post-operative Day 1	4.2 ± 1.1
Post-operative Day 7	1.5 ± 0.7

p-value< 0.001

The study demonstrated that the direct anterior approach in THA resulted in significant pain reduction and acceptable complication rates, with no significant differences based on patient demographics.

Discussion

The study evaluated 200 patients who undertook THA using the direct anterior approach. The mean age was 65.3 years, with a nearly equal gender distribution (55% male, 45% female). The primary preoperative diagnoses included osteoarthritis (60%), avascular necrosis (25%), and rheumatoid arthritis (15%). These demographics suggest a typical cohort of patients who might benefit from hip arthroplasty.

Intraoperative parameters were closely monitored, revealing an average surgical time of approximately 95 minutes and a mean blood loss of around 200 ml. These figures align with expected outcomes for the direct anterior approach, indicating that the procedure was conducted efficiently and with manageable blood loss. Such data underscores the procedural feasibility and the careful surgical management applied during the operations.

Postoperative outcomes were particularly noteworthy. Pain scores significantly decreased from a mean of 4.2 on

postoperative day 1 to 1.5 by day 7, demonstrating substantial pain relief within the first week post-surgery. This rapid reduction in pain highlights the effectiveness of the direct anterior approach in managing postoperative discomfort. Additionally, the mean hospital stay was 4.8 days, indicating a relatively swift recovery period for most patients. These outcomes reflect positively on the procedure's impact on patient recovery and overall hospital resource utilization.

The study also recorded an overall complication rate of 10%, with wound infection being the most common complication, occurring in 4% of participants. Other complications included dislocation (3%), deep vein thrombosis (2%), and nerve injury (1%). These rates are within acceptable limits for major orthopedic surgeries, suggesting that the direct anterior approach is relatively safe. Importantly, there were no significant differences in complication rates across different demographics such as age, gender, and preoperative diagnosis, indicating that this surgical approach is broadly applicable to diverse patient populations without increasing the risk of complications.

To determine the most important research in the field, an analysis was conducted on the top 100 most cited articles on THA. The majority of the top 100 publications, as indicated by the results, were observational studies and clinical trials that were published between 1990 and 2019. Post-operative thromboembolism, spinopelvic mobility, dual-mobility cups, outpatient THA, direct anterior approach, polyethylene, acetabular deformities, periprosthetic fracture, and tranexamic acid were the most frequently occurring themes in the top 100 publications [7].

Research hotspots in THA research were also highlighted by the study [8], including racial disparity, depression, AI, and PROM. A examination of the developments and breakthroughs in total hip replacement brought attention to how technology might enhance results. Modern robotics has made acetabular placement more accurate and repeatable, but long-term statistics are still needed to determine how cost-effective it is. Dual mobility bearings, patient-specific equipment, and other THA developments were covered in the review as well [9].

Another study examined the content and readability of online resources pertaining to revision THA. Based on the validated DISCERN score and the unique revision THA-specific Vancouver Revision Arthroplasty Information score, the study discovered that only 28% of websites contained 'excellent' quality information. Because of their high information quality and readability, the study suggested visiting governmental and health-related websites [10].

The results of THA using a minimally invasive (MI) and conventional (CA) technique were evaluated by a systematic review and meta-analysis. There were no appreciable variations in complications, re-operations, or satisfaction among patients between MI and CA THA, according to the findings [11].

Conclusion

In summary, the direct anterior approach in THA shows promising results in terms of pain reduction, safety, and recovery. The significant decrease in pain scores, the acceptable complication rates, and the short hospital stays collectively support the efficacy and efficiency of this surgical method. These findings suggest that the direct anterior approach is a favorable option for patients requiring hip replacement, offering effective pain management and a quick recovery while maintaining a manageable safety profile. This approach can be considered for a wide range of patients, making it a versatile and reliable choice in orthopedic surgery.

Limitations: The limitations of this study include a small sample population who were included in this study. Furthermore,

the lack of comparison group also poses a limitation for this study's findings.

Recommendation: Future studies should focus on long-term outcomes and comparisons with other surgical approaches to validate these findings further. Training programs for surgeons on DAA could enhance its adoption and improve patient outcomes.

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List of abbreviations:

THA - Total Hip Arthroplasty
DAA - Direct Anterior Approach
VAS - Visual Analog Scale
AI - Artificial Intelligence
PROM - Patient-Reported Outcome Measures
MI - Minimally Invasive
CA - Conventional

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