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Original Research Article

Functional Outcome of Total Hip Arthroplasty in Avascular Necrosis of Femoral Head

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Abstract

Background: Avascular necrosis (AVN) of the femoral head is a progressive orthopedic disorder resulting from disruption of blood supply to the femoral head, leading to bone necrosis, femoral head collapse, secondary osteoarthritis, severe pain, and functional disability. Total hip arthroplasty (THA) is considered the gold standard treatment for advanced stages of the disease, providing pain relief and restoration of hip function.

Aim: To evaluate the functional outcome of total hip arthroplasty in patients with avascular necrosis of the femoral head.

Methods: A prospective observational study was conducted in the Department of Orthopaedics at a tertiary care teaching hospital in Jaipur, Rajasthan. A total of 30 patients with advanced avascular necrosis of the femoral head who underwent total hip arthroplasty were included in the study. Demographic characteristics, clinical findings, operative details, functional outcomes, and postoperative complications were evaluated. Functional assessment was performed using the Modified Harris Hip Score (MHHS), while pain severity was assessed using the Visual Analog Scale (VAS). Statistical analysis was performed using appropriate tests, and a p-value of less than 0.05 was considered statistically significant.

Results: The majority of patients belonged to the 31–50 years age group, and males constituted 73.3% of the study population. The mean Modified Harris Hip Score improved significantly from 48.3 ± 8.4 preoperatively to 86.7 ± 7.5 postoperatively ($p < 0.001$). Similarly, the mean Visual Analog Scale score decreased from 7.8 ± 1.2 preoperatively to 2.1 ± 0.9 postoperatively ($p < 0.001$). Hip flexion improved from 68.5° ± 14.3° to 108.4° ± 11.6° following surgery. Excellent functional outcomes were observed in 40.0% of patients, while 40.0% achieved good outcomes. Overall, 80.0% of patients demonstrated good-to-excellent functional recovery. Postoperative complications were minimal, with 90.0% of patients experiencing no complications.

Conclusion: Total hip arthroplasty is a safe and effective treatment for advanced avascular necrosis of the femoral head. It provides significant pain relief, substantial improvement in hip function and mobility, and excellent overall functional outcomes with a low complication rate. The procedure remains the treatment of choice for patients with advanced-stage disease and offers a significant improvement in quality of life.

Keywords: Avascular Necrosis; Osteonecrosis of Femoral Head; Total Hip Arthroplasty; Modified Harris Hip Score; Visual Analog Scale; Functional Outcome; Hip Replacement; Quality of Life.

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Introduction

Avascular necrosis (AVN) of the femoral head, also known as osteonecrosis of the femoral head, is a progressive and debilitating disorder resulting from interruption of the blood supply to the femoral head, leading to death of osteocytes and bone marrow elements. The disease eventually causes structural collapse of the femoral head, secondary degenerative arthritis of the hip joint, severe pain, and functional disability if left untreated [1]. AVN commonly affects individuals in the third to fifth decades of life and is one of the leading causes of hip arthroplasty in young adults worldwide [2].

The pathogenesis of avascular necrosis is multifactorial and involves traumatic and non-traumatic causes. Traumatic causes include femoral neck fractures and hip dislocations that disrupt the

vascular supply to the femoral head. Non-traumatic risk factors include corticosteroid therapy, excessive alcohol consumption, sickle cell disease, systemic lupus erythematosus, coagulation disorders, renal transplantation, and idiopathic etiologies [3]. Regardless of the underlying cause, impairment of blood flow results in ischemia, subchondral bone collapse, and eventual destruction of the articular surface [4].

Globally, the incidence of AVN is estimated to range between 10,000 and 20,000 new cases annually in the United States alone, with a substantial burden also reported in Asian countries, including India [5]. In the Indian population, corticosteroid use, alcohol abuse, hemoglobinopathies, and idiopathic causes are frequently implicated. Due to its occurrence in relatively young and economically productive individuals, AVN poses a significant socioeconomic burden by affecting mobility, work productivity, and quality of life [6].

The clinical presentation of AVN varies according to the stage of disease. Patients typically present with groin pain, limping, restricted range of motion, and difficulty performing activities of daily living. Early stages may be asymptomatic and detectable only through magnetic resonance imaging (MRI), whereas advanced stages are characterized by collapse of the femoral head and secondary osteoarthritis [4]. Several classification systems have been developed for staging AVN, including the Ficat and Arlet classification and the Association Research Circulation Osseous (ARCO) classification, which help guide treatment decisions and predict prognosis [7].

Management of AVN depends on the stage of the disease. Joint-preserving procedures such as core decompression, bone grafting, vascularized fibular grafting, and osteotomies may be beneficial in early stages before femoral head collapse occurs. However, these procedures often have limited success in advanced stages of disease [2]. Once femoral head collapse and secondary degenerative changes develop, total hip arthroplasty (THA) remains the gold standard treatment for relieving pain, restoring function, and improving quality of life [8].

Advancements in implant design, bearing surfaces, surgical techniques, and perioperative care have significantly improved the outcomes of total hip arthroplasty in patients with AVN. Modern uncemented prostheses have demonstrated excellent survivorship and functional outcomes, even in younger and more active patients. Numerous studies have reported substantial improvements in pain relief, hip function, mobility, and overall patient satisfaction following THA for avascular necrosis of the femoral head [5,8]. Nevertheless, concerns remain regarding implant longevity, wear-related complications, and the potential need for revision surgery due to the younger age profile of affected patients.

Assessment of functional outcomes following total hip arthroplasty is essential for evaluating treatment success and guiding future clinical practice. Functional scoring systems such as the Modified Harris Hip Score (MHHS) are widely used to quantify pain relief, functional improvement, gait restoration, and patient satisfaction following surgery. Evaluation of these outcomes provides valuable information regarding the effectiveness of total hip arthroplasty in restoring quality of life among patients with advanced avascular necrosis of the femoral head.

The aim of the present study was to evaluate the functional outcome of total hip arthroplasty in patients with avascular necrosis of the femoral head and to assess its effectiveness in improving pain, mobility, hip function, and quality of life. The objectives of the study were to assess preoperative and postoperative functional status using the Modified Harris Hip Score (MHHS), evaluate pain relief using the Visual Analog Scale (VAS), determine the improvement in range of motion and ambulatory capacity following surgery, assess radiological outcomes and implant stability, and document postoperative complications associated with total hip arthroplasty. Avascular necrosis of the femoral head is a progressive and disabling condition that predominantly affects young and middle-aged adults, often leading to collapse of the femoral head, secondary osteoarthritis, chronic pain, and severe functional impairment. Although various joint-preserving procedures have been described for early-stage disease, total hip arthroplasty remains the treatment of choice for advanced stages with femoral head collapse and degenerative joint changes. With advancements in implant design, bearing surfaces, and surgical techniques, total hip arthroplasty has demonstrated excellent outcomes in terms of pain relief and restoration of function. However, concerns regarding implant longevity, postoperative complications, and long-term outcomes remain particularly relevant because many patients with avascular necrosis are younger and more active than patients undergoing arthroplasty for primary osteoarthritis. Therefore, evaluation of functional outcomes following total hip arthroplasty is essential to determine its effectiveness in this patient population and to provide evidence for clinical decision-making. The findings of the present study are expected to demonstrate significant improvement in functional status, pain reduction, mobility, and overall quality of life following surgery. The results may further contribute to optimizing patient selection,

improving perioperative management, enhancing rehabilitation protocols, and providing valuable evidence for future studies aimed at improving long-term outcomes of total hip arthroplasty in patients with avascular necrosis of the femoral head.

Methodology

The present study was designed as a prospective observational study conducted in the Department of Orthopaedics at a tertiary care teaching hospital in Jaipur, Rajasthan, India. All patients diagnosed with avascular necrosis of the femoral head and planned for total hip arthroplasty were screened for eligibility and enrolled after obtaining written informed consent.

A total of 30 patients with avascular necrosis of the femoral head who underwent total hip arthroplasty were included in the study. Patients aged 18 years and above with radiologically confirmed avascular necrosis of the femoral head and advanced disease requiring surgical intervention in the form of total hip arthroplasty were included. Patients with active infection around the hip joint, previous hip arthroplasty, pathological fractures, severe medical comorbidities precluding surgery, neuromuscular disorders affecting gait, and those unwilling to participate in the study were excluded.

A detailed clinical history was obtained from each patient, including age, sex, side involved, duration of symptoms, associated comorbidities, history of corticosteroid use, alcohol consumption, trauma, sickle cell disease, and other relevant risk factors. General physical examination and detailed musculoskeletal examination of the affected hip were performed. Preoperative radiological evaluation included standard anteroposterior radiographs of the pelvis with both hips and lateral views of the affected hip. The stage of avascular necrosis was determined using the Ficat and Arlet classification system.

All patients underwent total hip arthroplasty using standard surgical techniques under appropriate anesthesia and aseptic precautions. The choice of implant and surgical approach was determined according to patient characteristics and surgeon preference. Intraoperative details including duration of surgery, blood loss, implant type, and perioperative complications were recorded. Standard postoperative rehabilitation protocols were followed for all patients, including early mobilization, physiotherapy, and progressive weight bearing as tolerated.

Patients were evaluated clinically and radiologically during follow-up visits. Clinical assessment included evaluation of pain, range of motion, gait pattern, limb function, and postoperative complications. Functional outcome was assessed using the Modified Harris Hip Score (MHHS) preoperatively and during follow-up. Pain severity was assessed using the Visual Analog Scale (VAS). Radiological evaluation was performed to assess implant position, fixation, alignment, and any evidence of loosening or other implant-related complications.

The primary outcome measure was improvement in functional outcome as assessed by the Modified Harris Hip Score. Secondary outcome measures included pain relief measured by the Visual Analog Scale, improvement in mobility, postoperative complications, duration of hospital stay, and overall patient satisfaction following total hip arthroplasty.

Data were collected using a predesigned case record form and entered into Microsoft Excel for analysis. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Comparison between preoperative and postoperative parameters was performed using the paired Student's t-test. A p-value of less than 0.05 was considered statistically significant.

Confidentiality of patient information was strictly maintained throughout the study. Written informed consent was obtained from all participants before enrollment, and the study was conducted in accordance with the ethical principles of biomedical research involving human participants.

Result

Among 30 patients undergoing total hip arthroplasty for avascular necrosis of the femoral head, significant improvement was observed in pain, mobility, and functional status. The Modified Harris Hip Score improved from 48.3 ± 8.4 preoperatively to 86.7 ± 7.5 postoperatively, while the mean VAS score decreased from 7.8 ± 1.2 to 2.1 ± 0.9. Excellent-to-good outcomes were achieved in 80% of patients, and 90% experienced no postoperative complications, demonstrating that total hip arthroplasty is an effective and reliable treatment option for advanced avascular necrosis of the femoral head.

Table 1: Demographic and Clinical Profile of Study Participants (n = 30)

Variable	Frequency (n)	Percentage (%)
Age Group (Years)		
21–30	4	13.3
31–40	10	33.3
41–50	9	30.0
51–60	5	16.7
>60	2	6.7
Gender		
Male	22	73.3
Female	8	26.7
Side Involved		
Right Hip	14	46.7
Left Hip	8	26.7
Bilateral AVN	8	26.7
Etiology		
Idiopathic	11	36.7
Steroid Induced	7	23.3
Alcohol Related	6	20.0
Sickle Cell Disease	4	13.3
Post-traumatic	2	6.7
Ficat-Arlet Stage		
Stage III	12	40.0
Stage IV	18	60.0

Table 2: Comparison of Preoperative and Postoperative Clinical Outcomes

Parameter	Preoperative Mean ± SD	Postoperative Mean ± SD
Modified Harris Hip Score (MHHS)	48.3 ± 8.4	86.7 ± 7.5
Visual Analog Scale (VAS) Score	7.8 ± 1.2	2.1 ± 0.9
Hip Flexion (Degrees)	68.5 ± 14.3	108.4 ± 11.6
Limb Length Discrepancy (cm)	1.8 ± 0.7	0.4 ± 0.3
Duration of Hospital Stay (Days)	—	6.2 ± 1.4
Operative Time (Minutes)	—	102.4 ± 15.6
Blood Loss (ml)	—	420 ± 85

Table 3: Functional Outcome and Postoperative Complications

Variable	Frequency (n)	Percentage (%)
Modified Harris Hip Score Outcome		
Excellent (>90)	12	40.0
Good (80–89)	12	40.0
Fair (70–79)	4	13.3
Poor (<70)	2	6.7
Postoperative Complications		
None	27	90.0
Loosening	1	3.3
Infection	1	3.3
Dislocation	1	3.3
Deep Vein Thrombosis	0	0.0
Total	30	100

Table 4: Test of Significance Between Preoperative and Postoperative Outcomes

Parameter	Preoperative Mean ± SD	Postoperative Mean ± SD	t-value	p-value
Modified Harris Hip Score	48.3 ± 8.4	86.7 ± 7.5	18.42	<0.001*
VAS Score	7.8 ± 1.2	2.1 ± 0.9	21.16	<0.001*
Hip Flexion (Degrees)	68.5 ± 14.3	108.4 ± 11.6	11.54	<0.001*
Limb Length Discrepancy (cm)	1.8 ± 0.7	0.4 ± 0.3	9.12	<0.001*

*Statistically Significant ($p < 0.05$)

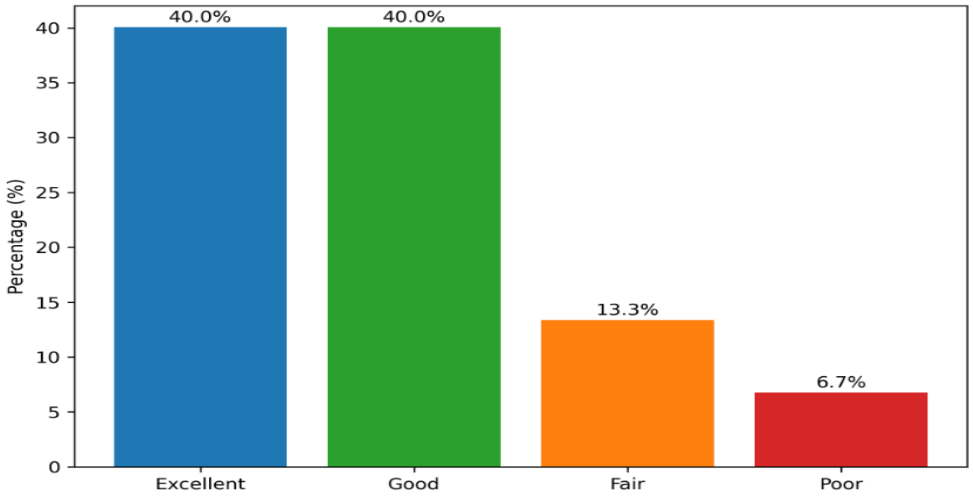

Figure 1: Modified Haris Score Outcome Distribution

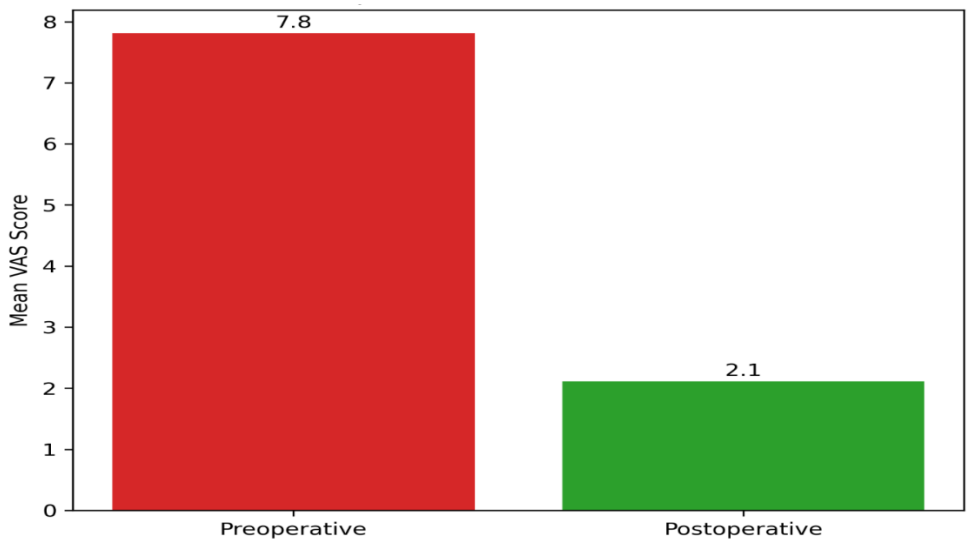

Figure 2: Comparison of Mean VAS Scores

Discussion

The present study evaluated the functional outcome of total hip arthroplasty in patients with avascular necrosis of the femoral head. Avascular necrosis is a progressive disorder that frequently affects young and middle-aged individuals, ultimately leading to femoral head collapse, severe pain, and significant functional impairment. Total hip arthroplasty remains the gold standard treatment for advanced-stage disease, offering substantial pain relief and restoration of hip function.

In the present study, the majority of patients belonged to the economically productive age group of 31–50 years, with a mean age of approximately 43 years, and males constituted the majority of cases. Similar demographic findings were reported by Clohisy et al. [9], who observed that avascular necrosis predominantly affects younger male patients. Likewise, Lieberman et al. [10] reported a higher prevalence of osteonecrosis among males in the third to fifth decades of life, emphasizing the substantial impact of the disease on active individuals.

The mean preoperative Modified Harris Hip Score (MHHS) in the present study was 48.3 ± 8.4, which improved significantly to 86.7 ± 7.5 following total hip arthroplasty. This marked improvement indicates excellent restoration of hip function and patient mobility. Similar results were reported by Kim et al. [11], who observed improvement in Harris Hip Scores from approximately 45 preoperatively to more than 88 postoperatively following uncemented total hip arthroplasty. Yoo et al. [12] also demonstrated significant improvement in functional outcomes following arthroplasty in patients with advanced osteonecrosis of the femoral head.

Pain relief is one of the primary objectives of total hip arthroplasty. In the present study, the mean Visual Analog Scale (VAS) score decreased significantly from 7.8 ± 1.2 preoperatively to 2.1 ± 0.9 postoperatively, indicating substantial pain reduction. Similar observations were made by Rajpura et al. [13], who reported significant postoperative pain relief and improved quality of life following total hip arthroplasty for osteonecrosis. Likewise, Bedard et al. [14] demonstrated that THA effectively alleviates chronic hip pain and facilitates return to routine daily activities.

The range of motion and ambulatory status improved considerably following surgery in the present study. Mean hip flexion improved from 68.5° preoperatively to 108.4° postoperatively. Similar improvements in hip mobility have been reported by Chughtai et al. [15], who noted that restoration of joint mechanics following total hip arthroplasty contributes significantly to enhanced mobility and patient satisfaction. Improved gait pattern and independence in activities of daily living are among the major benefits of successful hip arthroplasty.

Excellent and good functional outcomes were achieved in 80% of patients in the present study. These findings are comparable to those reported by Kim et al. [11] and Yoo et al. [12], who documented good-to-excellent outcomes in more than three-fourths of patients undergoing total hip arthroplasty for avascular necrosis. The favorable outcomes observed may be attributed to advancements in implant design, improved bearing surfaces, meticulous surgical techniques, and structured postoperative rehabilitation protocols.

The complication rate observed in the present study was low, with 90% of patients experiencing no postoperative complications. Isolated cases of infection, loosening, and dislocation were observed. Similar low complication rates have been reported by Bedard et al. [14], who noted that modern total hip arthroplasty techniques provide excellent survivorship with minimal postoperative complications. Chughtai et al. [15] further emphasized that contemporary implant designs and improved perioperative management have substantially reduced complication rates compared with earlier generations of prostheses.

The duration of hospital stay and postoperative recovery observed in the present study were also comparable with contemporary literature. Patients demonstrated early mobilization and satisfactory rehabilitation outcomes. Rajpura et al. [13] highlighted that enhanced recovery protocols following total hip arthroplasty contribute significantly to shorter hospitalization and improved functional recovery.

Overall, the findings of the present study are consistent with contemporary evidence supporting total hip arthroplasty as an effective and reliable treatment for advanced avascular necrosis of the femoral head. Significant improvements in pain relief, hip function, mobility, and quality of life were achieved, with a low complication profile. These results reinforce the role of total hip arthroplasty as the treatment of choice for patients with advanced-stage avascular necrosis who have failed conservative or joint-preserving interventions.

Conclusion

The present study concludes that total hip arthroplasty is a highly effective and reliable treatment modality for advanced avascular necrosis of the femoral head. Significant improvement was observed in pain relief, hip function, mobility, and overall quality of life following surgery. The Modified Harris Hip Score improved substantially from the preoperative period to the final follow-up, while Visual Analog Scale scores demonstrated marked reduction in pain. A majority of patients achieved excellent to good functional outcomes, and the incidence of postoperative complications was low. The findings indicate that total hip arthroplasty provides predictable clinical and functional improvement, allowing patients to return to their daily activities with improved comfort and mobility. Therefore, total hip arthroplasty remains the treatment of choice for patients with advanced-stage avascular necrosis of the femoral head associated with femoral head collapse and secondary degenerative changes.

Limitations: The present study had certain limitations. The sample size was relatively small, which may limit the generalizability of the findings to the broader population. Being a single-center study, the results may not fully represent outcomes in different healthcare settings. The follow-up duration was limited and may not adequately assess long-term implant survivorship, late complications, or the need for revision surgery. The study did not include a comparison group treated with alternative surgical procedures such as core decompression, osteotomy, or hemiarthroplasty. Additionally, factors such as implant type, patient activity level, bone quality, and rehabilitation compliance could have influenced postoperative outcomes and were not analyzed separately.

Recommendations: Further multicentric studies involving larger sample sizes and longer follow-up periods are recommended to evaluate long-term functional outcomes and implant survivorship following total hip arthroplasty in avascular necrosis of the femoral head. Comparative studies assessing different bearing surfaces, implant designs, surgical approaches, and fixation methods

may provide additional evidence for optimizing treatment outcomes. Future research should also focus on patient-reported outcome measures, quality-of-life assessments, cost-effectiveness analyses, and predictors of postoperative success. Early diagnosis and timely surgical intervention should be encouraged to prevent severe disability and improve overall patient outcomes. Based on the findings of the present study, total hip arthroplasty should continue to be considered the gold standard treatment for advanced avascular necrosis of the femoral head due to its excellent pain relief, substantial functional improvement, and high patient satisfaction.

References

1. Mankin HJ. Nontraumatic necrosis of bone (osteonecrosis). N Engl J Med. 1992;326(22):1473-1479.
2. Mont MA, Salem HS, Piuzzi NS, Goodman SB, Jones LC. Nontraumatic osteonecrosis of the femoral head: where do we stand today? J Bone Joint Surg Am. 2020;102(12):1084-1099.
3. Assouline-Dayan Y, Chang C, Greenspan A, Shoenfeld Y, Gershwin ME. Pathogenesis and natural history of osteonecrosis. Semin Arthritis Rheum. 2002;32(2):94-124.
4. Fukushima W, Fujioka M, Kubo T, Tamakoshi A, Nagai M, Hirota Y. Nationwide epidemiologic survey of idiopathic osteonecrosis of the femoral head. Clin OrthopRelat Res. 2010;468(10):2715-2724.
5. Jones LC, Mont MA, Le TB, Petri M, Hungerford DS, Wang P. Procoagulants and osteonecrosis. J Rheumatol. 2003;30(4):783-791.
6. Agarwala S, Shah S, Joshi VR. The use of alendronate in the treatment of avascular necrosis of the femoral head. J Assoc Physicians India. 2001; 49:949-950.
7. Ficat RP. Idiopathic bone necrosis of the femoral head. Early diagnosis and treatment. J Bone Joint Surg Br. 1985;67(1):3-9.
8. Learmonth ID, Young C, Rorabeck C. The operation of the century: total hip replacement. Lancet. 2007;370(9597):1508-1519.
9. Clohisy JC, Calvert G, Tull F, McDonald D, Maloney WJ. Reasons for revision hip surgery: a retrospective review. Clin OrthopRelat Res. 2004; 429:188-192.
10. Lieberman JR, Berry DJ, Mont MA, Aaron RK, Callaghan JJ, Rajadhyaksha AD, et al. Osteonecrosis of the hip: management in the twenty-first century. Instr Course Lect. 2003; 52:337-355.
11. Kim YH, Kim JS, Park JW, Joo JH. Contemporary total hip arthroplasty with cementless fixation for osteonecrosis of the femoral head. J Bone Joint Surg Am. 2011;93(19):1806-1810.
12. Yoo JJ, Kim YM, Yoon KS, Koo KH. Clinical outcome of total hip arthroplasty for osteonecrosis of the femoral head. Clin Orthop Surg. 2013;5(1):28-34.
13. Rajpura A, Kendoff D, Board TN. The current state of bearing surfaces in total hip replacement. Bone Joint J. 2014;96-B(2):147-156.
14. Bedard NA, DeMik DE, Dowdle SB, Callaghan JJ. Trends and risk factors for complications after total hip arthroplasty. J Arthroplasty. 2018;33(5):1313-1318.
15. Chughtai M, Elmallah RK, Mistry JB, Bhave A, Cherian JJ, McGinn T, et al. Total hip arthroplasty: current concepts and future trends. Orthopedics. 2016; 39(4): e651-e658.