

Original Research Article

Clinical and functional outcome of total hip replacement/arthroplasty for avascular necrosis of the femoral head

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ABSTRACT

Background: Avascular necrosis (AVN) of the femoral head is a progressive condition leading to femoral head collapse, particularly affecting young to middle-aged adults. Total hip replacement (THR) is the gold-standard salvage procedure for end-stage disease.

Methods: This prospective observational study was conducted at Khwaja Yunus Ali Medical College and Hospital, Bangladesh, from January 2024 to January 2026. Forty-five patients with ARCO stage III or IV AVN underwent THR via the Hardinge lateral approach. Outcomes were assessed using the Harris hip score (HHS) preoperatively and at 6, 12, and 24 weeks postoperatively. Complications were recorded throughout follow-up.

Results: The mean age was 42.8 ± 10.7 years, with male predominance (73.3%). Corticosteroid use (35.6%) was the most common cause, followed by alcohol abuse (22.2%). Most patients (62.2%) had ARCO stage IV disease. The mean HHS improved from 45.2 ± 8.7 preoperatively to 92.6 ± 4.8 at 24 weeks ($p < 0.001$). Excellent-to-good outcomes were in 84.4%. Complications included limb length discrepancy (6.7%), superficial wound infection (4.4%), Trendelenburg gait (4.4%), and dislocation (2.2%). No deep infections, nerve injuries, or fractures.

Conclusions: Total hip replacement via the Hardinge lateral approach offers excellent pain relief, notable functional gains, and low complication rates in advanced AVN of the femoral head. Longer-term studies are needed to evaluate implant survivorship.

Keywords: Avascular necrosis, Femoral head, Hardinge approach, Harris Hip Score, Total hip replacement

INTRODUCTION

Avascular necrosis (AVN) of the femoral head is a progressive, debilitating condition characterized by interruption of the subchondral blood supply, leading to osseous cellular death, structural compromise, and subsequent collapse of the femoral head.¹ This pathological cascade most frequently afflicts young to middle-aged adults, with a mean age of presentation often in the fourth or fifth decade of life, thereby imposing a substantial socioeconomic burden due to prolonged disability and loss of productive work-years.² The etiological landscape of AVN is diverse, encompassing traumatic causes- such as femoral neck fractures and hip dislocations- and non-traumatic factors including chronic

corticosteroid use, excessive alcohol consumption, systemic lupus erythematosus, sickle cell disease, and idiopathic origins.^{3,4} Despite advances in early detection with magnetic resonance imaging (MRI), a significant proportion of patients progress to advanced stages [association research circulation osseous (ARCO) stages III-IV], in which conservative measures and joint-preserving procedures, such as core decompression or vascularized fibular grafting, demonstrate limited efficacy.^{5,6}

When non-surgical or joint-preserving interventions fail, total hip arthroplasty (THA) remains the gold-standard salvage procedure for end-stage AVN, reliably alleviating pain and restoring hip biomechanics.⁷ However, the

outcomes of THA in AVN patients have historically been a subject of debate. Younger, more active patients with AVN often pose unique challenges compared to older osteoarthritic cohorts, including higher rates of early aseptic loosening, accelerated polyethylene wear, and periprosthetic osteolysis.^{8,9} Moreover, the quality of the underlying bone stock in AVN is sometimes compromised by sclerotic or cystic changes, and the potential for residual osteonecrotic progression in the remaining native bone can influence long-term implant survival.¹⁰ Consequently, contemporary research has focused on optimizing implant selection, bearing surfaces, and surgical approaches to improve functional recovery and minimize complications in this specific patient subgroup.

The surgical approach in THA influences outcomes, dislocation, and abductor muscle morbidity. The lateral transgluteal approach, popularized by Hardinge, balances the preservation of the posterior capsule and external rotators with adequate femoral exposure, potentially reducing the risk of dislocation without compromising abductor function.¹¹ However, comparisons of outcomes using the Hardinge approach in AVN are limited, especially in developing nations with different patient demographics, activity levels, and implant access. The choice of cemented versus uncemented prostheses depends on age, bone quality, and surgeon preference. Uncemented prostheses, favored by younger patients with healthy bone, offer good long-term fixation, while cemented implants are useful in elderly osteoporotic patients.¹¹ The lateral (Hardinge) approach is popular for its excellent exposure, accurate implant placement, and low dislocation rates.¹²

In Bangladesh, the rising AVN cases, mainly due to non-prescription corticosteroids and delayed trauma care, have increased young patients with femoral head collapse.¹² Khwaja Yunus Ali Medical College and Hospital, a tertiary center in the north, sees a steady increase in advanced AVN cases requiring THA. Yet, region-specific data on outcomes following THA with the Hardinge lateral approach are limited. This two-year prospective study evaluates the clinical and functional outcomes of 45 patients with AVN who underwent total hip replacement via the Hardinge approach. The aim of this study was to assess the clinical and functional outcomes of total hip replacement in patients with avascular necrosis of the femoral head.

Objectives

General objective

To evaluate the clinical and functional outcomes of total hip replacement (THR) for avascular necrosis of the femoral head.

Specific objectives

To assess postoperative pain relief and functional recovery using the Harris Hip Score at 6 and 12 months. To

determine the frequency of complications throughout the entire treatment after surgery.

METHODS

This prospective observational study was conducted in the department of orthopedic at Khwaja Yunus Ali Medical College and Hospital, Bangladesh, over a two-year period from January 2024 to January 2026. The study aimed to evaluate the clinical and functional outcomes of total hip replacement (THR) in patients with avascular necrosis (AVN) of the femoral head. A total of 45 patients diagnosed with AVN based on clinical assessment, radiographic findings, and magnetic resonance imaging (MRI) were enrolled consecutively. Patients aged between 18 and 70 years with ARCO stage III or IV disease who had failed conservative treatment for at least six months were included in the study. Patients with active hip infection, inflammatory arthritis, pathological fractures due to malignancy, severe medical comorbidities precluding surgery, neuromuscular disorders affecting gait, or previous surgery on the affected hip were excluded.

A detailed preoperative evaluation was performed for all patients, including demographic characteristics, risk factors, clinical examination, and radiological assessment. Baseline functional status was assessed using the Harris hip score (HHS), which evaluates pain, function, deformity, and range of motion. Of all patients, 38 underwent uncemented total hip replacement, and 7 underwent cemented total hip replacement through the Hardinge (direct lateral) approach. The procedure was performed under regional or general anesthesia with the patient in the lateral decubitus position. A standard lateral incision was made over the greater trochanter, and the hip joint was exposed through a transgluteal approach. Following femoral neck osteotomy, acetabular preparation was performed with sequential reaming and implantation of a press-fit cementless acetabular component. The femoral canal was prepared using sequential broaches, and a cementless porous-coated femoral stem was inserted. After trial reduction and confirmation of stability, definitive components were implanted, and the abductor mechanism was meticulously repaired before layered wound closure.

Postoperatively, all patients received standardized analgesia, antibiotic prophylaxis, and thromboprophylaxis when indicated, as well as supervised physiotherapy. Early mobilization was encouraged from the first postoperative day. Patients were followed up at 6, 12, and 24 weeks after surgery. Clinical and functional outcomes were assessed using the Harris hip score, range-of-motion measurements, gait evaluation, and activities of daily living. Postoperative complications, including dislocation, infection, nerve injury, periprosthetic fracture, Trendelenburg gait, and limb length discrepancy, were recorded. Data were analyzed using SPSS version 25.0. Continuous variables were expressed as mean±standard deviation (SD), while categorical variables were presented as frequencies and

percentages. Comparisons between preoperative and postoperative outcomes were performed using paired Student's t-test, and a p value of less than 0.05 was considered statistically significant.

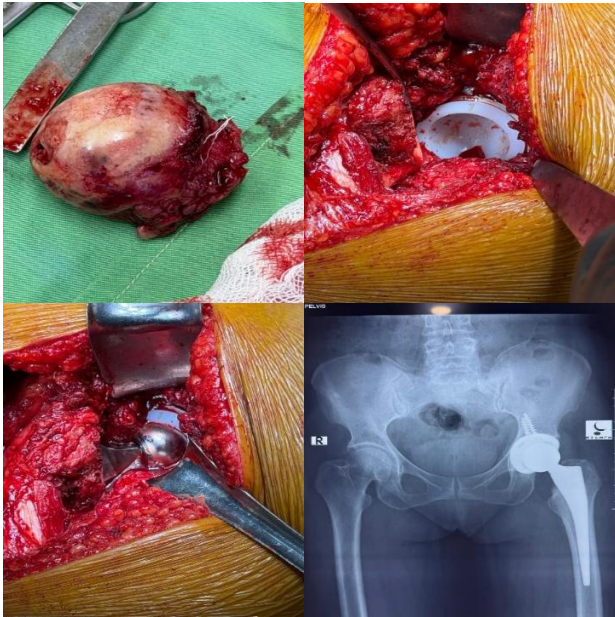


Figure 1: Intraoperative pictures and immediate postoperative x-ray.

RESULTS

A total of 45 patients with avascular necrosis (AVN) of the femoral head underwent total hip replacement using the Hardinge lateral approach and completed the follow-up period. The mean age of the patients was 42.8 ± 10.7 years, ranging from 24 to 68 years. The majority of the patients were male (73.3%). Corticosteroid use was identified as the most common etiological factor (35.6%), followed by alcohol abuse (22.2%) and previous trauma (17.8%). Most patients presented with advanced disease, with 62.2% classified as ARCO stage IV.

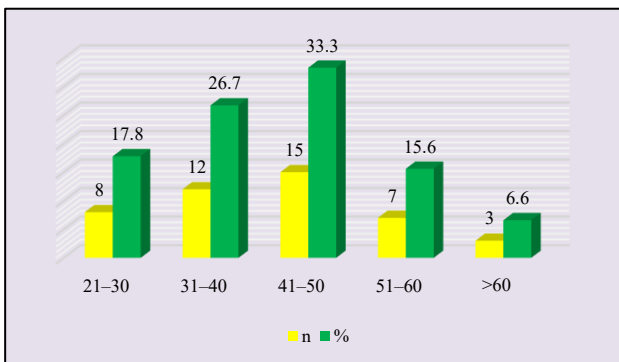


Figure 2: Age distribution of the study patients (n=45).

A significant improvement in functional outcome was observed following surgery. The mean Harris Hip Score

increased from 45.2 ± 8.7 preoperatively to 92.6 ± 4.8 at 24 weeks postoperatively ($p < 0.001$). Pain relief, gait performance, activities of daily living, and range of motion also showed marked improvement. At the final follow-up, 84.4% of patients achieved excellent or good functional outcomes. Postoperative complications were minimal, with limb length discrepancy being the most common complication (6.7%).

Figure 2 shows the demographic profile of the study population. The highest proportion of patients (33.3%) belonged to the 41-50 years age group, followed by 31-40 years (26.7%). The mean age was 42.8 ± 10.7 years.

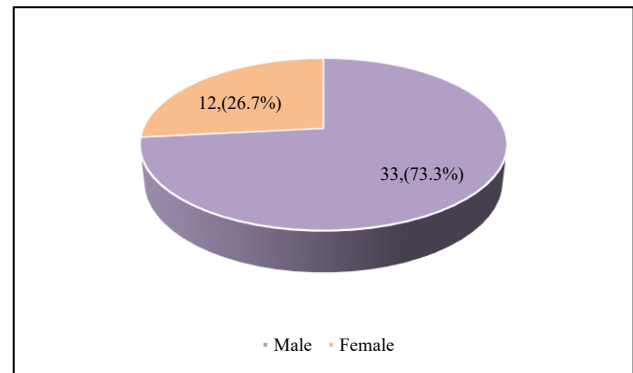


Figure 3: Gender distribution of the study patients (n=45).

Figure 3 shows that Male patients predominated, accounting for 73.3% of the total study population, resulting in a male-to-female ratio of approximately 2.8:1.

Table 1: Clinical profile of the study patients (n=45).

Variables	N	%
Etiology of AVN		
Corticosteroid use	16	35.6
Alcohol abuse	10	22.2
Previous trauma	8	17.8
Idiopathic	9	20.0
Sickle cell disease	2	4.4
ARCO stage		
Stage III	17	37.8
Stage IV	28	62.2
Type for THR		
Uncemented	38	84.4
Cemented	7	15.6

Table 1 illustrates the clinical characteristics of the patients. Corticosteroid use was the most frequent etiological factor for AVN, observed in 35.6% of patients, followed by alcohol abuse (22.2%) and idiopathic causes (20.0%). Regarding disease severity, most patients (62.2%) were diagnosed with ARCO stage IV disease, while 37.8% had stage III disease. Uncemented THR was performed in 84.4% of cases, and cemented THR in 15.6%.

Table 2: Comparison of Harris hip score during follow-up (n=45).

Follow-up Period	Mean HHS $\pm$ SD	P value*
Preoperative	45.2 $\pm$ 8.7	—
6 weeks	79.4 $\pm$ 7.2	<0.001
12 weeks	87.8 $\pm$ 6.1	<0.001
24 weeks	92.6 $\pm$ 4.8	<0.001

*Compared with preoperative score.

Table 2 demonstrates a significant improvement in the Harris Hip Score following total hip replacement. The mean preoperative HHS was 45.2 $\pm$ 8.7, indicating poor hip function. The score improved to 79.4 $\pm$ 7.2 at 6 weeks, 87.8 $\pm$ 6.1 at 12 weeks, and 92.6 $\pm$ 4.8 at 24 weeks. The improvement was statistically significant at all follow-up intervals ($p < 0.001$).

Table 3: Comparison of functional outcome components during follow-up (n=45).

Variables	Preoperative (mean $\pm$ SD)	24 weeks (mean $\pm$ SD)	P value
Pain score	16.8 $\pm$ 5.2	42.1 $\pm$ 2.6	<0.001
Gait score	14.2 $\pm$ 4.5	31.1 $\pm$ 2.1	<0.001
Activities score	6.5 $\pm$ 2.4	13.3 $\pm$ 0.9	<0.001
Range of motion score	2.1 $\pm$ 1.0	4.8 $\pm$ 0.4	<0.001

Table 3 compares the individual components of the Harris hip score before surgery and at 24 weeks postoperatively. Significant improvements were observed in all domains. The mean pain score increased from 16.8 $\pm$ 5.2 to 42.1 $\pm$ 2.6, indicating substantial pain relief. Similarly, the gait score, activity score, and range-of-motion score improved significantly after surgery ($p < 0.001$ for all comparisons).

Table 4: Functional outcome at final follow-up according to Harris hip score (n=45).

Outcome category	N	%
Excellent (90-100)	24	53.3
Good (80-89)	14	31.1
Fair (70-79)	5	11.1
Poor (<70)	2	4.5

Table 4 presents the final functional outcome of the patients based on Harris hip score classification. More than half of the patients (53.3%) achieved excellent outcomes, while 31.1% achieved good outcomes. Overall, 84.4% of patients experienced excellent-to-good functional recovery. Only 4.5% of patients had poor outcomes at the final follow-up.

Table 5 shows the postoperative complications encountered during follow-up. Limb length discrepancy was the most common complication, occurring in 6.7% of patients. Superficial wound infection and temporary

Trendelenburg gait were each observed in 4.4% of cases. Hip dislocation occurred in one patient (2.2%). No cases of deep infection, nerve injury, or periprosthetic fracture were reported, indicating a favorable safety profile of the procedure.

Table 5: Postoperative complications following THR (n=45).

Complications	N	%
Limb length discrepancy	3	6.7
Superficial wound infection	2	4.4
Temporary Trendelenburg gait	2	4.4
Dislocation	1	2.2
Deep infection	0	0.0
Periprosthetic fracture	0	0.0
Nerve injury	0	0.0

DISCUSSION

This prospective study evaluated total hip replacement (THR) performed via the Hardinge lateral approach in patients with advanced avascular necrosis (AVN). It showed significant improvements in hip function, pain relief, gait, and daily activities, with few complications. These findings endorse THR as an effective treatment for end-stage AVN.

In this study, the patients had a mean age of 42.8 $\pm$ 10.7 years, mostly in their 40s and 50s. The group was 73.3% male. The average age in the THA group was 48.4 $\pm$ 9.44 years.¹³ Jaanbasha et al reported that patients aged 31 to 40 were most affected, with about 43.3% of participants having avascular necrosis.¹⁴

Corticosteroid use was the leading cause in this series at 35.6%, followed by alcohol abuse at 22.2%, and trauma at 17.8%. These results align with studies by Mont et al and Shah et al, who identified corticosteroid exposure and chronic alcohol consumption as the main non-traumatic factors causing femoral head osteonecrosis globally.^{3,15} The increased availability and rampant use of corticosteroids in developing countries may be driving the higher incidence of AVN seen in clinical practice. Most patients in this study were at ARCO stage IV (62.2%), showing advanced femoral head collapse. Similar late-stage cases have been observed in South Asian populations, where delayed diagnosis and limited access to orthopedic specialists remain common issues.^{16,17}

The most significant finding of the present study was the marked improvement in Harris hip score (HHS) following total hip replacement (THR). The mean HHS increased from 45.2 $\pm$ 8.7 preoperatively to 92.6 $\pm$ 4.8 at 24 weeks postoperatively ($p < 0.001$). A study found significant improvements in pain and function with modern hip arthroplasty implants, achieving excellent postoperative functional outcomes in most patients.¹⁸ A recent systematic review conducted by Liu et al further

corroborated that contemporary THR offers reliable pain relief and functional restoration in patients with femoral head osteonecrosis.⁶

Analysis of individual HHS components revealed significant improvements across all functional domains. The mean pain score improved from 16.8 ± 5.2 to 42.1 ± 2.6 , reflecting substantial postoperative pain relief. Similar findings have been reported by Taleb A et al., who found the mean Harris hip score improved from 41.8 ± 7.6 preoperatively to 88.6 ± 5.4 postoperatively, with a mean difference of 46.8 ($p < 0.001$).¹⁹ Improvements in gait, activity, and range-of-motion scores observed in the current study indicate successful restoration of hip biomechanics and enhanced patient independence. These findings are in agreement with those reported by Sodhi N et al., who demonstrated significant gains in quality of life and physical function after hip arthroplasty.²⁰

At final follow-up, 53.3% of patients achieved excellent outcomes, and 31.1% achieved good outcomes according to HHS classification, yielding an overall excellent-to-good outcome rate of 84.4%. Fadlalla et al similarly reported high rates of excellent functional recovery in younger adults undergoing ceramic-on-ceramic THA.²¹

The majority of patients in this study underwent uncemented THR (84.4%), whereas only 15.6% received cemented implants. This reflects contemporary trends favoring cementless fixation in younger patients with adequate bone quality. Tanzer and Noiseux reported excellent osseointegration and long-term biological fixation with porous-coated cementless implants, making them particularly suitable for younger, active patients.²² Similarly, Evans et al demonstrated excellent long-term survivorship of modern cementless hip prostheses in a large systematic review and meta-analysis.²³

The postoperative complication rate was low, with limb length discrepancy (6.7%) being most common, followed by superficial wound infection and temporary Trendelenburg gait (4.4% each). One patient (2.2%) had dislocation; no deep infection, nerve injury, or periprosthetic fracture occurred. The low dislocation rate may relate to the Hardinge lateral approach, which preserves soft tissues and enhances stability. Hardinge described this approach as providing good exposure and reducing instability.¹¹ Healy et al noted that early complications like infection and dislocation remain relevant despite surgical advances.²⁴ Dale et al highlighted the risk of prosthetic joint infection, stressing perioperative vigilance.²⁵ Temporary Trendelenburg gait was seen in two patients. Although the Hardinge approach involves partial abductor detachment, careful repair often restores function.

Overall, the findings of the present study demonstrate that total hip replacement using the Hardinge lateral approach provides excellent pain relief, significant functional improvement, and a low complication rate in patients with

advanced AVN of the femoral head. The results are consistent with contemporary international literature and reinforce the role of THR as the gold-standard treatment for end-stage osteonecrosis when joint-preserving procedures are no longer feasible.^{3,6,11,26}

This single-center study with 45 patients, a 24-week follow-up, no control group, and potential selection bias is limited. Lack of long-term data prevents assessing implant survivorship, loosening, or revisions. Outcome assessors weren't blinded, and only the Harris hip score was used for patient feedback.

CONCLUSION

Total hip replacement via the Hardinge lateral approach markedly enhances clinical and functional results in patients with advanced avascular necrosis of the femoral head. This is supported by a rise in the mean Harris Hip Score from 45.2 to 92.6 at 24 weeks ($p < 0.001$). The procedure shows a strong safety profile, with low complication rates, including dislocation (2.2%), and no reports of deep infections or nerve injuries. Corticosteroid use was identified as the leading cause (35.6%). Total hip replacement remains the preferred salvage option for end-stage AVN, although longer-term research is needed to confirm implant longevity in this young, active group.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Zalavras CG, Lieberman JR. Osteonecrosis of the femoral head: evaluation and treatment. *J Am Acad Orthop Surg.* 2014;22(7):455-64.
2. Moya-Angeler J, Gianakos AL, Villa JC, Ni A, Lane JM. Current concepts on osteonecrosis of the femoral head. *World J Orthop.* 2015;6(8):590-601.
3. Mont MA, Salem HS, Piuze NS, Goodman SB, Jones LC. Nontraumatic osteonecrosis of the femoral head: where do we stand today? *J Bone Joint Surg Am.* 2020;102(12):1084-99.
4. Cohen-Rosenblum A, Cui Q. Osteonecrosis of the femoral head. *Orthop Clin North Am.* 2019;50(2):139-49.
5. Larson E, Jones LC, Goodman SB, Koo KH, Cui Q. Early-stage osteonecrosis of the femoral head: where are we and where are we going? *J Bone Joint Surg Am.* 2018;100(10):879-88.
6. Liu F, Wang W, Yang L, Wang B, Wang J, Chai W, et al. An epidemiological study of etiology and clinical characteristics in patients with nontraumatic osteonecrosis of the femoral head. *J Res Med Sci.* 2017;22:15.
7. Bedard NA, Callaghan JJ, Liu SS, Greiner JJ, Klaassen AL, Johnston RC. Cementless THA for the treatment of osteonecrosis at 10-year follow-up: have

- we improved compared to cemented THA? *J Arthroplasty.* 2013;28(7):1192-9.
8. Migliorini F, La Padula G, Oliva F, Torsiello E, Hildebrand F, Maffulli N. Operative management of avascular necrosis of the femoral head in skeletally immature patients: a systematic review. *Life (Basel).* 2022;12(2):179.
 9. Capone A, Podda D, Civinini R, Marongiu G, Ennas F, Pisanu G, et al. Total hip arthroplasty for avascular necrosis of the femoral head: a comparison between different bearing surfaces. *J Clin Med.* 2022;11(9):2415.
 10. Wang Y, Wang K, Wang H, Zhu W, Feng B, Liang R, et al. Long-term results of cementless total hip arthroplasty for osteonecrosis of the femoral head: a systematic review. *Hip Int.* 2017;27(4):328-34.
 11. Pai VS. A modified direct lateral approach in total hip arthroplasty. *J Orthop Surg.* 2002;10(1):35-9.
 12. Islam MJ, Hossain MS, Islam MA, Rahman MM, Chowdhury MA, Ahmed S, et al. Pattern of non-traumatic avascular necrosis of femoral head in a tertiary care hospital in Bangladesh. *J Bangladesh Coll Phys Surg.* 2019;37(4):180-5.
 13. Hanumanth Araya GH, Kamala GR. A study on AVN cases attending at a tertiary care hospital: etiological factors and treatment. *Indian J Orthop Surg.* 2016;2(1):69-76.
 14. Jaanbasha M, Palakurthi V, Nagnur MI, Bari MA, Danish MF, Mohiuddin MA. A study of clinical and functional outcome of total hip replacement in avascular necrosis of femoral head. *Eur J Cardiovasc Med.* 2024;14(2):1029-35.
 15. Shah KN, Racine J, Jones LC, Aaron RK. Pathophysiology and risk factors for osteonecrosis. *Orthop Clin North Am.* 2019;50(2):139-52.
 16. Choi HR, Steinberg ME, Cheng EY. Osteonecrosis of the femoral head: diagnosis and treatment. *J Am Acad Orthop Surg.* 2020;28(17):e717-28.
 17. Park JW, Kim HS, Park S, Kim SH, Lee YK, Koo KH. Trends in surgical treatment of femoral head osteonecrosis in South Korea: An Analysis Using Nationwide Claims Database. *Clin Orthop Surg.* 2022;14(4):500-6.
 18. Lee JM. The current concepts of total hip arthroplasty. *Hip Pelvis.* 2016;28(4):191-200.
 19. Taleb A, Jahedi M, Rahman MM, Hasanujaman MS, Haque R, Al-Habib H, et al. Functional outcomes and complications after total hip arthroplasty in adult patients. *J Orthopaed Trauma Rehabil.* 2026;9(1):126-30.
 20. Sodhi N, Acuna A, Etcheson J, Mohamed N, Davila I, Ehiorobo JO, et al. Management of osteonecrosis of the femoral head. *Bone Joint J.* 2020;102-B(7_Supple_B):122-8.
 21. Fadlalla MH, Ahmed MM, Mohamed AA, Mohamed EA, Jarelnape AA, Ahmed AA, et al. Functional outcome after total hip replacement using ceramic-on-ceramic among young adults' patients. *Sudan J Med Sci.* 2024;19(3).
 22. Karatas ME, Kemah B, Soylemez MS, Saglam N. Mid-term survivorship and clinical results of cementless total hip arthroplasty for steroid-induced avascular necrosis. *North Clin Istanbul.* 2024;11(3):219-24.
 23. Evans JT, Evans JP, Walker RW, Blom AW, Whitehouse MR, Sayers A. How long does a hip replacement last? A systematic review and meta-analysis of case series and national registry reports with more than 15 years of follow-up. *Lancet.* 2019;393(10172):647-54.
 24. Healy WL, Iorio R, Clair AJ, Pellegrini VD, Della Valle CJ, Berend KR. Complications of total hip arthroplasty: standardized list, definitions and stratification developed by the hip society. *Clin Orthopaed Rel Res.* 2016;474(2):357-64.
 25. Dale H, Fenstad AM, Hallan G, Havelin LI, Furnes O, Overgaard S, et al. Increasing risk of prosthetic joint infection after total hip arthroplasty: 2,778 revisions due to infection after 432,168 primary THAs in the Nordic Arthroplasty Register Association (NARA). *Acta Orthopaed.* 2012;83(5):449-58.
 26. Lieberman JR, Berry DJ, Montv MA, Aaron RK, Callaghan JJ, Rayadhyaksha A, Urbaniak JR. Osteonecrosis of the hip: management in the twenty-first century. *J Bone Joint Surg.* 2002;84(5):834-53.

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