Original Article

Comparison of Early Functional Outcomes and Gait Following Total Hip Arthroplasty through Lateral and Posterior Approaches: A Prospective Study in a Tertiary Care Hospital

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Abstract

Background: The study compares early functional outcomes and gait following Total Hip Arthroplasty (THA) through lateral (Hardinge) and posterior (Moore) approaches in 60 patients diagnosed with end-stage hip disorders. Conducted at a tertiary care hospital, patients were equally divided into two groups, with assessments performed at various postoperative intervals using the Harris Hip Score (HHS), gait evaluation, and pain measurement via the Visual Analogue Scale (VAS). **Material and Methods:** Both approaches improved hip function and quality of life significantly over time. However, the posterior approach demonstrated notably superior functional recovery and gait restoration, with higher HHS scores at 6 weeks (75.8 vs. 70.6, p=0.004) and 3 months (88.1 vs. 84.2, p=0.01). At 3 months, 80% of patients in the posterior group achieved a normal gait compared to 60% in the lateral group (p=0.048). Lower pain scores were also noted in the posterior approach, and it facilitated a greater range of motion, particularly in hip flexion (113° vs. 108°, p=0.03). **Results:** The lateral approach was associated with a shorter operative time (76.5 vs. 82.1 minutes, p=0.03) but resulted in more significant postoperative limp and Trendelenburg positivity, though this did not reach statistical significance. Complication rates were low and comparable across both groups, with no dislocations in the lateral approach. **Conclusion:** Both surgical methods are effective for THA, but the posterior approach offers advantages in early functional recovery and gait improvement, while the lateral approach provides a faster surgery time and robust joint stability. Future multicenter, randomized trials with larger sample sizes and extended follow-up are warranted to confirm these findings and guide surgical decision-making.

Keywords: Arthroplasty, Fracture, Hip, Rehabilitation, Restoration, Bone.

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Introduction

Total hip arthroplasty (THA) is one of the most successful orthopaedic procedures for pain relief, functional restoration, and improvement in quality of life of patients with end stage hip diseases, such as osteoarthritis, avascular necrosis of the femoral head, rheumatoid arthritis, and femoral neck fractures. Improvements in implant design, surgical techniques, perioperative care and rehabilitation protocols have considerably improved implant longevity and patient satisfaction making THA the gold standard treatment for disabling hip disorders.[1,2] The number of THA procedures performed annually worldwide is more than 1 million, with the number expected to rise substantially with the ageing population and growing prevalence of degenerative joint diseases.[3] Implant selection and fixation techniques are important for surgical success but the choice of surgical approach remains one of the most controversial elements of primary THA. The ideal surgical approach should provide excellent exposure of the hip joint with minimal soft tissue damage, preservation of muscle function, reduction in postoperative pain, early mobilisation, and decreased complications such as dislocation, nerve injury, and gait abnormalities.[4] The most used surgical approaches are the posterior, direct lateral (Hardinge), anterolateral and direct anterior approaches, each having their own advantages and disadvantages.[4,5]

The posterior approach has been a commonly utilised technique historically because of its good visualisation of the acetabulum and femur, accurate implant positioning, preservation of the hip abductor mechanism, and relatively shorter operative time. Preservation of the gluteus medius muscle often leads to better postoperative abductor strength and gait recovery. However, the relatively higher risk of postoperative dislocation due to violation of the posterior capsule and short external rotators remains a concern unless careful soft tissue repair is performed.[5,6] The direct lateral (Hardinge) approach gives excellent exposure with a lower incidence of postoperative dislocation due to preservation of the posterior soft tissue structures. However, even

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partial detachment of the gluteus medius and minimum muscles may compromise abductor function, leading to postoperative limp, positive Trendelenburg sign, and delayed normalisation of gait. The lateral approach has also been reported to cause injury to the superior gluteal nerve and persistent abductor weakness.[4,7] Early functional recovery after THA is an increasingly important outcome measure, as modern enhanced recovery protocols emphasise rapid mobilisation, shorter hospital stay, earlier return to daily activities, and improved patient satisfaction. Functional outcomes are routinely assessed with validated instruments such as the Harris Hip Score (HHS). Gait analysis provides an objective measure of the postoperative recovery of muscle function and biomechanics. Restoration of normal gait pattern is especially important, since persistent limping negatively affects patient satisfaction despite adequate pain relief and radiographic success.[8,9] Several randomised trials, prospective studies and systematic reviews have compared different surgical approaches in THA. Barber et al. found similar long term Harris Hip Scores for direct lateral and posterior approaches but differences in early abductor strength and Trendelenburg gait.[7] Berstock et al. in a systematic review and meta-analysis of prospective studies demonstrated that the posterior approach was associated with a significantly lower incidence of Trendelenburg gait compared with the lateral approach whereas there was no significant difference in overall complication rates or long-term functional outcomes.[4] However, no consensus exists in the literature due to the heterogeneity of the patient population, surgeon experience, rehab protocols and outcome assessment methods.[4,7] Furthermore, the evidence of early gait recovery in Indian population is scarce. Most studies available have focused mainly on implant survival, radiographic outcomes or overall functional scores rather than on objective gait assessment during the early postoperative period. Prospective gait assessment with functional outcomes is clinically important for optimising surgical decision making and patient counselling, since gait restoration directly correlates to preservation of periarticular musculature and functional rehabilitation.[9,10] Hence the present prospective study was undertaken to compare the early functional outcome and gait between lateral approach and posterior approach in patients undergoing primary total hip arthroplasty. Standardised clinical outcome measures were used to assess functional recovery. Gait analysis was used to assess differences in postoperative ambulation and abductor function. Results of the present study may help orthopaedic surgeons to determine the most appropriate surgical approach for optimal early rehabilitation and functional recovery after THA.

Materials and Methods

Study Design and Setting: This is a prospective comparative observational study conducted in Department of Orthopaedics in a Great Eastern Medical School and Hospital a tertiary care teaching hospital. The objective of the study was to compare the early functional outcome and gait parameters in patients undergoing primary Total Hip Arthroplasty (THA) through the lateral (Hardinge) or the posterior (Moore) approach. The study was conducted for a period of 24 months after the approval from the Institutional Ethics Committee. All participants provided written informed consent before being enrolled.

Study Population: Patients diagnosed with end-stage hip disorders requiring primary unilateral Total Hip Arthroplasty were consecutively recruited during the study period 2023 to 2025.

Sample Size: A total of 60 patients were included in the study, with 30 patients undergoing THA through the lateral approach and 30 patients undergoing THA through the posterior approach.

Inclusion Criteria

The inclusion criteria for patients in the study were as follows: The participants had to be aged between 18 and 80 years and were required to undergo primary unilateral Total Hip Arthroplasty (THA). Eligible diagnoses comprised osteoarthritis, avascular necrosis of the femoral head, rheumatoid arthritis, ankylosing spondylitis, femoral neck fracture, or secondary osteoarthritis that necessitated THA. Furthermore, all patients needed to demonstrate the ability to ambulate independently prior to surgery, either with or without the use of a walking aid. Additionally, participants were required to show willingness to participate in the study and provide written informed consent. Lastly, commitment to comply with postoperative rehabilitation and follow-up was essential for inclusion.

Exclusion Criteria

Patients were excluded from the study based on several criteria designed to ensure the integrity and applicability of the results. Exclusions included individuals undergoing revision total hip arthroplasty, those who received bilateral total hip arthroplasty during the same hospitalization, or individuals with a history of previous hip surgery on the affected side. Additionally, the presence of active infections surrounding the hip joint disqualified patients, as did neurological disorders that could impact gait, such as stroke, Parkinson's disease, or multiple sclerosis. Severe lower limb deformities that hindered gait assessment also led to exclusion, as well as any cognitive impairments that might obstruct functional evaluations. Furthermore, patients with significant cardiopulmonary illnesses that would preclude rehabilitation were excluded, along with those who were lost to follow-up prior to the completion of the study, ensuring that the evaluated cohort was optimal for analyzing outcomes related to the hip intervention.

Preoperative Evaluation: All patients underwent a comprehensive preoperative evaluation that included several key components: demographic profiling (age, sex, BMI), gathering clinical history, identifying the affected side, diagnosing the reason for total hip arthroplasty (THA), assessing the duration of symptoms, and noting any comorbidities. Baseline pain levels were measured using the Visual Analogue Scale (VAS), and the Harris Hip Score (HHS) was recorded. Additionally, physical assessments included the Trendelenburg test and evaluation for limb length discrepancies. Routine hematological and biochemical tests were performed, along with a thorough radiographic assessment which included anteroposterior pelvis imaging of both hips, lateral hip radiography, and templating for implant selection.

Surgical Procedure: All surgeries were performed by

experienced orthopedic surgeons under spinal or combined spinal-epidural anesthesia using standard aseptic precautions.

Patients were allocated into two groups according to the surgical approach employed.

Group A – Lateral (Hardinge) Approach

The document outlines the procedural steps for total hip arthroplasty (THA) performed using the direct lateral (Hardinge) approach. Key elements of the procedure include positioning the patient in a lateral decubitus position, making a longitudinal skin incision over the greater trochanter, and then splitting the gluteus medius and minimus muscles. An anterior capsulotomy is conducted, followed by a femoral neck osteotomy. Acetabular preparation and implant placement are then performed, along with femoral preparation. The choice between a cemented or uncemented prosthesis is determined based on patient characteristics. Finally, the procedure concludes with a layer-wise closure of the wound and repair of the abductors.

Group B – Posterior (Moore) Approach

Patients underwent Total Hip Arthroplasty (THA) utilizing a posterior approach. The procedure involved several key steps: positioning the patient in lateral decubitus, making a curved posterior incision, splitting the gluteus maximus fibers, detaching the short external rotators through capsulotomy, performing a femoral neck osteotomy, preparing the acetabulum, inserting the implant, preparing the femur, repairing the posterior capsule and external rotators, and finally, closing the wound layer by layer.

Postoperative Rehabilitation: All patients adhered to a standardized rehabilitation protocol designed for postoperative care following surgery. The immediate postoperative care involved several key components: administration of intravenous antibiotics as per hospital protocol, thromboprophylaxis using low molecular weight heparin or oral anticoagulants to prevent thromboembolism, and a multimodal approach to pain management. Patients were instructed to follow specific hip precautions based on the surgical method employed. Early rehabilitation began with static quadriceps exercises on the first postoperative day, alongside ankle pump and deep breathing exercises to enhance circulation and lung function.

Mobilization protocols were initiated on postoperative day one, where patients were encouraged to sit at the bedside. They progressed to walker-assisted ambulation by the end of the first or the start of the second postoperative day, with weight-bearing activities tailored to the stability of the implant fixation. Training also included stair climbing as part of the progression towards functional independence. Following discharge, patients were provided with a home exercise program to continue their rehabilitation journey effectively.

Outcome Measures: The primary outcome measure for functional assessment in this study is the Harris Hip Score (HHS), which evaluates pain, function, absence of deformity, and range of motion, with a total score ranging from 0 to 100. Interpretations classify outcomes as excellent (90–100), good (80–89), fair (70–79), or poor (<70), with assessments conducted preoperatively and at 2 weeks, 6 weeks, 3 months, and 6 months post-operation. Secondary outcomes include gait assessment, which measures walking speed, cadence, step and stride lengths, single limb support time, presence of limp, Trendelenburg gait, and the need for walking aids, evaluated by independent assessors at each follow-up visit.

Pain Assessment: Pain was assessed using the Visual Analogue Scale (VAS) from 0 to 10. Hip range of motion measurements included flexion, extension, abduction, adduction, internal and external rotation, using a goniometer. Abductor muscle strength was evaluated with the Medical Research Council grading system, and limb length discrepancy was measured from the anterior superior iliac spine to the medial malleolus. Surgical variables recorded included surgery duration, blood loss, incision length, implant type, and blood transfusion needs. Postoperative variables encompassed length of hospital stay, time to independent ambulation, stair climbing, and discontinuation of walking aids. Complications monitored included dislocation, surgical site infection, deep vein thrombosis, and nerve injuries, among others. Follow-up evaluations occurred at preoperative baseline, 2 weeks, 6 weeks, 3 months, and 6 months, assessing clinical condition, Harris Hip Score, gait, pain, and complications.

Data Collection: A structured case record form was used to collect demographic, clinical, operative, radiological, and follow-up data. Data were entered into a secure electronic database with unique study identification numbers to maintain participant confidentiality.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics version 22.0, with continuous variables represented as mean ± standard deviation or median (interquartile range) based on distribution. Categorical variables were shown as frequency and percentage. Normality was checked using the Shapiro–Wilk test. Comparisons between groups utilized various statistical methods: independent Student's t-test for normally distributed data, Mann–Whitney U test for non-normally distributed data, and Chi-square or Fisher's exact test for categorical variables. Functional outcomes and gait parameters were compared using repeated measures ANOVA or mixed-effects analysis, while Pearson's or Spearman's correlation analysis evaluated associations where appropriate. A p-value ≤ 0.05 was deemed statistically significant.

Ethical Considerations: The study protocol was approved by the Institutional Ethics Committee before initiation of the study. Written informed consent was obtained from all participants. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013 revision) and Good Clinical Practice (GCP) guidelines. Participant confidentiality was maintained by assigning unique identification numbers, and all study-related information was securely stored with access restricted to the research team.

Results

Study Population: A total of 60 patients undergoing primary Total Hip Arthroplasty (THA) were included in the study. Patients were equally divided into:

- Group A: Lateral Approach (n = 30)
- Group B: Posterior Approach (n = 30)

No patient was lost to follow-up during the 3-month

postoperative period.

Table 1: Demographic Characteristics

Variable	Lateral (n=30)	Posterior (n=30)	p-value
Mean Age (years)	61.8 ± 8.4	60.9 ± 7.9	0.68
Male	18 (60%)	17 (56.7%)	0.79
Female	12 (40%)	13 (43.3%)	
BMI (kg/m²)	26.4 ± 3.2	25.9 ± 3.4	0.54
Right Hip	17 (56.7%)	16 (53.3%)	0.79
Left Hip	13 (43.3%)	14 (46.7%)	

Table 2: Indications for THA

Diagnosis	Lateral	Posterior
Osteoarthritis	15 (50%)	16 (53.3%)
Avascular Necrosis	8 (26.7%)	7 (23.3%)
Fracture Neck of Femur	5 (16.7%)	5 (16.7%)
Rheumatoid Arthritis	2 (6.6%)	2 (6.7%)

No significant difference (p=0.98).

Table 3: Intraoperative Findings

Variable	Lateral	Posterior	p-value
Operative Time (minutes)	76.5 ± 10.2	82.1 ± 9.4	0.03*
Blood Loss (mL)	395 ± 70	425 ± 82	0.12
Length of Hospital Stay (days)	5.8 ± 1.2	5.2 ± 1.0	0.04*

*Statistically significant

The lateral approach required significantly less operative time, whereas patients in the posterior approach group experienced a slightly shorter hospital stay.

Table 4: Harris Hip Score Comparison

Time	Lateral	Posterior	p-value
Preoperative	42.8 ± 7.6	43.2 ± 7.9	0.84
6 Weeks	70.6 ± 6.8	75.8 ± 6.5	0.004*
3 Months	84.2 ± 5.9	88.1 ± 5.4	0.01*

Both groups showed significant improvement from baseline ($p<0.001$).
However, patients undergoing the posterior approach demonstrated significantly higher Harris Hip Scores at both 6 weeks and 3 months.

Table 5: Gait Recovery at 3 Months

Parameter	Lateral	Posterior	p-value
Normal gait	18 (60%)	24 (80%)	0.048*
Mild limp	9 (30%)	5 (16.7%)	
Moderate limp	3 (10%)	1 (3.3%)	

Normal gait was achieved by significantly more patients in the posterior approach group.

Table 6: Abductor Function

Result	Lateral	Posterior	p-value
Negative	23 (76.7%)	28 (93.3%)	
Positive	7 (23.3%)	2 (6.7%)	0.07

Although the posterior approach demonstrated fewer positive Trendelenburg tests, the difference did not reach statistical significance.

Table 7: Postoperative Pain Score

Time	Lateral	Posterior	p-value
Day 1	6.8 ± 1.0	6.4 ± 1.1	0.15
6 Weeks	2.8 ± 0.9	2.2 ± 0.8	0.02*
3 Months	1.2 ± 0.5	0.8 ± 0.4	0.01*

Posterior approach patients experienced significantly lower pain scores during follow-up.

Table 8: Hip Flexion

Time	Lateral	Posterior	p-value
Preoperative	72 ± 12°	71 ± 11°	0.83
3 Months	108 ± 9°	113 ± 8°	0.03*

Posterior approach demonstrated slightly greater postoperative hip flexion.

Table 9: Complications

Complication	Lateral	Posterior	p-value
Superficial infection	2 (6.7%)	1 (3.3%)	
Posterior dislocation	0	1 (3.3%)	
Limp	7 (23.3%)	3 (10%)	
DVT	1 (3.3%)	1 (3.3%)	
Periprosthetic fracture	0	0	0.58

Overall complication rates were low and comparable between the groups.

Table 10: Harris Hip Score Grading at 3 Months

Grade	Lateral	Posterior
Excellent (90–100)	10 (33.3%)	16 (53.3%)
Good (80–89)	15 (50%)	12 (40%)
Fair (70–79)	5 (16.7%)	2 (6.7%)
Poor (<70)	0	0

p = 0.04

Discussion

The purpose of the present prospective comparative study was to assess early functional outcomes and gait after Total Hip Arthroplasty (THA) using lateral and posterior approaches. Sixty patients were enrolled where 30 patients were in each group. The study found that both surgical approaches resulted in significant improvement in hip function and quality of life, but the posterior approach had better results in early functional recovery, gait, postoperative pain, and hip range of motion, while the lateral approach had a shorter operative time. The two groups were comparable in baseline demographic characteristics such as age, gender distribution, BMI, and operative side, indicating that differences in postoperative outcomes were likely due to surgical approach rather than confounding patient characteristics. This finding of comparable baseline characteristics is similar to that reported by Masonis and Bourne who stressed that comparable demographic variables are important for minimising bias in comparative THA studies.[11]

In the present study, the mean operative time was significantly shorter in the lateral approach group (76.5 ± 10.2 minutes) compared to the posterior approach group (82.1 ± 9.4 minutes; p=0.03). Shorter operative duration may be due to easier acetabular exposure and the surgeon's familiarity with the lateral approach. Jolles and Bogoch also reported a decreased operative time with the direct lateral approach compared with the posterior approach, attributing this to easier surgical exposure and less handling of soft tissues.[12] In contrast, no significant difference in operative duration between the two approaches has been reported by several authors, suggesting that surgeon experience is an important determinant.[13] Intraoperative blood loss was significantly higher in the posterior approach group, but not statistically significant (p=0.12). Similar findings were also seen by Restrepo et al. and they concluded there was comparable blood loss with slight numerical differences between both approaches.[14] This implies that differences in blood loss associated with the approach have been minimised by modern surgical techniques and perioperative blood conservation strategies. One of the most important findings of this study was that patients who underwent the posterior approach had a significantly better early functional recovery.

The Harris Hip Score (HHS) improved significantly in both groups from preoperatively approximately 43 points to postoperatively over 84 points (p<0.001) at three months. However, the posterior approach was associated with significantly better HHS at 6 weeks (75.8 vs. 70.6; p=0.004) and 3 months (88.1 vs. 84.2; p=0.01). These results are in line with Barrett et al., who described an improved early functional recovery after the posterior approach due to the preservation of the hip abductor mechanism.[15] Similarly, Meneghini et al. described earlier restoration of hip function and better patient satisfaction with posterior THA in the early postoperative months.[16] One of the main advantages of the posterior approach is considered to be the preservation of the hip abductors. The lateral approach may involve partial detachment of the gluteus medius and minimus, which may cause temporary abductor weakness and delay muscle recovery. This limitation of the direct lateral approach was originally described by Hardinge, who reported good long-term stability.[17] Baker and Bitounis also demonstrated that the lateral approach has a higher incidence of postoperative abductor weakness due to muscle splitting during surgical exposure.[18] In the present study, the gait recovery was significantly better in the posterior approach group. Eighty percent of patients had a normal gait at 3 months compared to 60% in the lateral approach group (p=0.048). Also, postoperative limping was less common in patients treated with posterior approach. These observations are supported by the results of Mjaaland et al. who reported superior gait parameters and faster

normalisation of walking speed after posterior THA during the early postoperative period.[19] The computerised gait analysis has also shown similar improvements in gait symmetry and muscle function.[20] Trendelenburg positivity, indicating hip abductor weakness, was more common following the lateral approach (23.3%) versus the posterior approach (6.7%) but this was not statistically significant. This trend correlates well with previous studies showing transient abductor insufficiency after the direct lateral approach. White et al. reported that preservation of abductor strength was significantly greater after posterior THA, especially in the first 6 months after surgery.[21]

Pain relief is the primary goal of THA. Postoperative pain measured by the Visual Analogue Scale (VAS) was significantly reduced in both groups, with less pain in the posterior approach at both 6 weeks and 3 months in the present study. These findings agree with the systematic review by Higgins et al., who concluded that preservation of muscle integrity in posterior THA contributes to reduced postoperative pain and faster rehabilitation.[22] Less trauma to the muscle probably allows early mobilisation and increases comfort for the patient. Hip range of motion was also superior in the posterior approach group with mean hip flexion of 113° compared to 108° in the lateral approach group (p=0.03). This difference may be explained by better preservation of periarticular soft tissues. Similarly, Kwon et al. demonstrated enhanced hip flexion and earlier functional independence in patients following posterior THA.[23]

Overall complication rate was low in both groups. One posterior dislocation occurred in the posterior approach group and there were no dislocations following the lateral approach. Historically, posterior THA has been associated with an increased risk of postoperative dislocation secondary to disruption of the posterior capsule and external rotators. However, modern repair of the posterior capsule has substantially reduced this risk. Pellicci et al. demonstrated that careful repair of the posterior soft tissues reduces the rate of dislocation to levels similar to other surgical approaches.[24] The absence of major difference in infection and thromboembolic events in the present study is in concordance with findings from large registry-based analyses.[25] Overall functional grading based on the Harris Hip Score demonstrated that more than half of the patients undergoing the posterior approach achieved excellent outcomes (53.3%) compared with one-third of patients in the lateral approach group (33.3%). However, both techniques achieved significant improvements in pain, mobility and quality of life, indicating that both are still effective surgical techniques when properly selected. The strengths of this study include its prospective design, equal distribution of patients, standardized rehabilitation protocol, and comprehensive evaluation of functional outcomes using validated scoring systems. However, some limitations should be acknowledged. The relatively small sample size, single-center design and short follow-up period of three months limit the generalisability of the findings. Implant survival, polyethylene wear, and late dislocation are examples of long-term complications that could not be assessed. Larger sample size and longer follow up multicenter randomised controlled trials are recommended to establish the long-term superiority of either surgical approach. To summarise, both the lateral and posterior approaches produced excellent short-term results after total hip arthroplasty. However, the posterior approach had better early functional recovery, better gait restoration, lesser postoperative pain, and better range of motion of the hip. The lateral approach was advantageous in terms of lesser operative time and excellent joint stability. Therefore, the choice of surgical approach must be made individually depending on the surgeon's expertise, the patient's anatomy and the clinical indications.

Conclusion

This prospective comparative study assessed early functional outcomes and gait following Total Hip Arthroplasty (THA) in 60 patients using lateral and posterior approaches. Both methods led to significant enhancements in pain relief, hip function, mobility, and overall quality of life postoperatively, confirming THA's effectiveness for end-stage hip disorders. Notably, those who underwent the posterior approach showed superior early outcomes, reflected in higher Harris Hip Scores, lower pain levels, improved hip mobility, and a greater percentage of normal gait restoration by three months. The preservation of the hip abductor mechanism in the posterior approach likely expedited rehabilitation and functional mobility.

In contrast, the lateral approach achieved shorter operative times and ensured excellent postoperative stability without dislocations, although transient limps and Trendelenburg positivity were more common. Overall, both approaches had low complication rates and were deemed safe for skilled surgeons. The posterior approach is highlighted for its superior early functional recovery, while the lateral approach serves as a reliable option, especially for patients at higher risk of instability. The study's limitations—such as its small sample size and single-center design—prompt the recommendation for larger, multicenter randomized trials with extended follow-up to further investigate long-term outcomes, gait biomechanics, and complication trends to better inform surgical approach selection in THA.

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Conflicts of interest

There are no conflicts of interest.

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