



EFFICACY OF GABAPENTIN IN POSTOPERATIVE PAIN MANAGEMENT FOLLOWING TOTAL HIP ARTHROPLASTY: A PROSPECTIVE RANDOMIZED STUDY.

Dr.Avinash Bajjuri¹, Dr Muni Sankar Reddy .M², Dr Jishnu J^{3*}

¹Assistant professor, BIRRD (T) Hospital

²Assistant professor, BIRRD (T) Hospital

^{3*}Associate professor BIRRD (T) Hospital

***Corresponding author:** Dr Jishnu J
ORCID ID- 0009-0002-4920

Abstract

Background: Postoperative pain following total hip arthroplasty (THA) influences early mobilization, opioid consumption, and length of hospital stay. Gabapentin has been proposed as an adjunct to multimodal analgesia due to its central sensitization–modulating properties; however, its efficacy in THA remains controversial.

Methods: This prospective randomized controlled study included 80 patients undergoing primary unilateral total hip arthroplasty at BIRRD HOSPITAL TIRUPATI a tertiary orthopaedic center between **January 2023 and June 2024**. Patients were allocated to receive either perioperative gabapentin (600 mg preoperatively followed by 300 mg twice daily for 48 hours) or standard multimodal analgesia without gabapentin. Postoperative pain was assessed using the Visual Analog Scale (VAS) at 6, 12, 24, and 48 hours. Total opioid consumption (morphine equivalents), time to ambulation, length of hospital stay, and adverse effects were recorded.

Results: Baseline demographic and clinical characteristics were comparable between groups. Postoperative VAS pain scores were numerically lower in the gabapentin group at all time points but did not reach statistical significance. Cumulative opioid consumption during the first 48 hours was significantly lower in the gabapentin group (18.6 ± 6.4 mg vs. 22.9 ± 7.1 mg; $p = 0.01$). There were no significant differences in time to first ambulation or length of hospital stay. Dizziness and somnolence occurred more frequently in patients receiving gabapentin ($p < 0.05$).

Conclusions: Perioperative gabapentin use following total hip arthroplasty results in a modest opioid-sparing effect without significant improvement in postoperative pain scores or functional recovery and is associated with increased sedation-related adverse effects. Routine use of gabapentin in THA cannot be recommended, and its administration should be individualized.

Keywords: Total hip arthroplasty, Gabapentin, Postoperative pain, Multimodal analgesia, Opioid consumption, Enhanced recovery after surgery

Introduction

Total hip arthroplasty (THA) is one of the most effective surgical interventions for relieving pain and restoring function in patients with end-stage hip disease¹. With the projected exponential rise in primary and revision hip arthroplasty worldwide, optimizing perioperative care has become increasingly important^{2,3}. Postoperative pain following THA, although generally less severe than after

knee arthroplasty, remains a major determinant of early mobilization, opioid consumption, length of stay, and patient satisfaction^{4–7}.

Multimodal analgesia forms the cornerstone of contemporary enhanced recovery after surgery (ERAS) protocols. Gabapentin, an $\alpha 2\delta$ subunit calcium-channel ligand, has been widely investigated as an adjunct analgesic due to its ability to attenuate central sensitization⁸. Meta-analyses across heterogeneous surgical populations suggest that gabapentin may reduce opioid consumption^{9,10}; however, evidence specific to THA remains conflicting^{14,15}. The present prospective randomized study aimed to evaluate the efficacy and safety of gabapentin in postoperative pain management following primary total hip arthroplasty.

Materials and Methods

Study Design

This was a **prospective, randomized, controlled study** conducted at BIRRD HOSPITAL TIRUPATI a tertiary orthopaedic center between **January 2023 and June 2024**. Institutional ethics committee approval was obtained, and written informed consent was secured from all participants.

Patient Selection

Eighty adult patients undergoing **primary unilateral total hip arthroplasty** for osteoarthritis or avascular necrosis were included. Exclusion criteria comprised chronic opioid use, renal insufficiency, seizure disorders, hypersensitivity to gabapentin, and revision arthroplasty.

Randomization and Groups

Patients were randomized into two groups:

- **Gabapentin group (Group G, n = 40)**
- **Control group (Group C, n = 40)**

Gabapentin Dosage Protocol

Patients in Group G received:

- **Gabapentin 600 mg orally 2 hours preoperatively**
- **Gabapentin 300 mg orally twice daily for 48 hours postoperatively**

The control group received identical perioperative care without gabapentin.

Analgesic Regimen

All patients received standardized multimodal analgesia including spinal anesthesia, paracetamol, NSAIDs, and opioid rescue analgesia as required.

Outcome Measures

Primary outcomes:

- Postoperative pain scores (VAS) at 6, 12, 24, and 48 hours
- Total opioid consumption (morphine equivalents) in the first 48 hours

Secondary outcomes:

- Time to first ambulation
- Length of hospital stay
- Adverse effects

Statistical Analysis

Continuous variables were analyzed using independent t-tests, and categorical variables using chi-square tests. Statistical significance was set at $p < 0.05$.

Results

Study Population

Eighty patients undergoing primary unilateral total hip arthroplasty were enrolled and randomized equally into the gabapentin group (Group G, n = 40) and control group (Group C, n = 40). All patients completed the study protocol and were included in the final analysis.

Table 1. Demographic and Preoperative Characteristics

Variable	Gabapentin (n=40)	Control (n=40)	p value
Age (years)	61.8 ± 8.4	60.9 ± 7.9	0.64
Male/Female	22 / 18	21 / 19	0.82
BMI (kg/m ²)	26.1 ± 3.2	25.8 ± 3.4	0.71
OA / AVN	28 / 12	29 / 11	0.81
ASA I / II / III	14 / 20 / 6	13 / 21 / 6	0.97

Result statement:

There were no statistically significant differences between the two groups with respect to age, sex distribution, body mass index, surgical indication, or ASA grade, indicating adequate baseline comparability.

Postoperative Pain Scores

Pain intensity was assessed using the Visual Analog Scale (VAS) at predefined postoperative intervals.

Table 2. Postoperative VAS Pain Scores

Time point	Gabapentin	Control	p value
6 hours	4.8 ± 1.1	5.2 ± 1.0	0.08
12 hours	4.2 ± 1.0	4.6 ± 1.1	0.10
24 hours	3.6 ± 0.9	3.9 ± 1.0	0.14
48 hours	2.9 ± 0.8	3.1 ± 0.9	0.26

Result statement:

Postoperative pain scores were consistently lower in the gabapentin group at all time points; however, none of these differences reached statistical significance.

Opioid Consumption

Total opioid consumption was calculated as cumulative morphine-equivalent dose over the first 48 postoperative hours.

Table 3. Cumulative Opioid Consumption (0–48 hours)

Group	Morphine Equivalent (mg)	p value
Gabapentin	18.6 ± 6.4	
Control	22.9 ± 7.1	0.01

Result statement:

Patients receiving gabapentin required significantly lower opioid doses during the first 48 hours postoperatively compared with controls.

Functional Recovery Outcomes

Early mobilization and hospital stay were evaluated as markers of functional recovery.

Table 4. Functional Recovery Parameters

Parameter	Gabapentin	Control	p value
Time to first ambulation (hours)	23.4 ± 4.8	22.9 ± 5.1	0.67
Distance walked on POD 2 (m)	42 ± 10	44 ± 11	0.39
Length of stay (days)	3.6 ± 0.9	3.5 ± 0.8	0.58

Result statement:

Gabapentin administration did not significantly influence early ambulation, walking distance, or length of hospital stay.

Adverse Effects

Adverse events were recorded during the hospital stay.

Table 5. Postoperative Adverse Effects

Adverse Effect	Gabapentin (n=40)	Control (n=40)	p value
Dizziness	9 (22.5%)	3 (7.5%)	0.04
Somnolence	7 (17.5%)	2 (5%)	0.03
Nausea/Vomiting	6 (15%)	7 (17.5%)	0.76
Falls	0	0	—

Discussion

The present prospective randomized study evaluated the efficacy of perioperative gabapentin as an adjunct to multimodal analgesia following primary total hip arthroplasty (THA). The principal findings of this study were that gabapentin administration resulted in a statistically significant reduction in postoperative opioid consumption but did not confer significant benefits in postoperative pain scores, early functional recovery, or length of hospital stay. Additionally, gabapentin use was associated with a higher incidence of sedation-related adverse effects, particularly dizziness and somnolence.

Interpretation of Pain Outcomes

Despite theoretical advantages related to attenuation of central sensitization, gabapentin did not significantly reduce postoperative pain scores at any measured time point in the first 48 hours following THA. This finding is consistent with previous randomized controlled trials evaluating gabapentin specifically in hip arthroplasty populations. Clarke et al. demonstrated that adding gabapentin to a standardized multimodal analgesic regimen did not reduce acute pain, opioid use, or chronic pain following THA¹⁴. Similarly, Paul et al. reported no clinically meaningful improvement in pain scores or rehabilitation outcomes with perioperative gabapentin administration¹⁵.

The relatively modest postoperative pain burden associated with THA, compared with procedures such as total knee arthroplasty (TKA), may partially explain the limited analgesic benefit observed. Chan et al. have shown that postoperative pain following hip arthroplasty is generally less intense and resolves earlier than after knee replacement⁴. Consequently, the contribution of central sensitization to postoperative pain may be less pronounced in THA, limiting the effectiveness of gabapentin in this setting.

Opioid-Sparing Effect

A key finding of the present study is the significant reduction in cumulative opioid consumption in the gabapentin group. This opioid-sparing effect has been consistently demonstrated across multiple

meta-analyses evaluating perioperative gabapentin use in various surgical populations^{9,10}. The proposed mechanism involves reduced excitatory neurotransmitter release and modulation of dorsal horn neuronal hyperexcitability⁸.

However, it is important to contextualize this opioid reduction. Although statistically significant, the reduction in opioid requirement did not translate into superior pain control or improved functional outcomes. This finding aligns with prior THA-specific trials, which similarly demonstrated opioid sparing without corresponding clinical benefit^{14,15}. In modern ERAS pathways, where baseline opioid consumption is already minimized through regional anesthesia, periarticular infiltration, and non-opioid analgesics, the incremental benefit of gabapentin may be further attenuated^{6,7}.

Functional Recovery and Length of Stay

Early mobilization is a critical determinant of successful recovery following THA. In the present study, gabapentin administration did not significantly influence time to first ambulation, walking distance on postoperative day two, or length of hospital stay. These findings are consistent with fast-track arthroplasty studies demonstrating that discharge readiness is influenced by multiple factors beyond pain control, including orthostatic tolerance, muscle strength, and patient confidence⁶.

Notably, the absence of functional benefit despite reduced opioid use suggests that non-pain-related factors may play a dominant role in early rehabilitation following THA. Dimitriou et al. emphasized that quality-of-life improvements following THA are primarily driven by restoration of function rather than short-term analgesic differences⁵.

Adverse Effects and Clinical Implications

Gabapentin use was associated with a significantly higher incidence of dizziness and somnolence in this study. These findings are consistent with prior reports identifying sedation-related side effects as a major limitation of gabapentinoid use in the perioperative period^{18,19}. In elderly THA patients, such adverse effects are particularly concerning due to the increased risk of delayed mobilization, falls, and postoperative delirium.

Importantly, gabapentin did not significantly reduce opioid-related adverse effects such as nausea and vomiting, suggesting that opioid reduction alone may not be sufficient to improve overall tolerability. Husted et al. have highlighted that dizziness and fatigue are among the most common barriers to early discharge after hip arthroplasty⁶, and gabapentin-induced sedation may therefore counteract the goals of enhanced recovery protocols.

Comparison with Total Knee Arthroplasty Literature

The role of gabapentin appears more favorable in TKA than in THA. Meta-analyses by Hamilton et al. and Zhai et al. demonstrated modest improvements in pain control and opioid consumption following TKA^{11–13}. This discrepancy likely reflects the higher postoperative pain burden and greater contribution of central sensitization in knee arthroplasty.

These procedure-specific differences underscore the importance of tailoring analgesic strategies to the surgical context rather than adopting a uniform approach across all arthroplasty procedures.

Clinical Relevance and Recommendations

The findings of this study suggest that routine administration of gabapentin following THA offers limited clinical benefit. While opioid consumption is reduced, the lack of improvement in pain scores, functional recovery, and length of stay—combined with increased sedation—limits its routine use in contemporary practice.

Selective use of gabapentin may still be considered in carefully chosen patients, such as those with pre-existing neuropathic pain, opioid tolerance, or heightened pain sensitivity. However, such use should involve cautious dosing and close monitoring.

Limitations

This study has several limitations. First, it was conducted at a single center, potentially limiting generalizability. Second, long-term outcomes such as chronic postoperative pain were not evaluated. Third, psychosocial variables influencing pain perception were not assessed. Future multicenter studies with longer follow-up are warranted to better define patient subgroups that may benefit from gabapentin.

Conclusion

Gabapentin use following total hip arthroplasty provides a modest opioid-sparing effect but does not significantly improve postoperative pain, functional recovery, or length of hospital stay. The increased incidence of sedation-related adverse effects limits its routine use. Multimodal analgesia for THA should remain individualized, with cautious and selective incorporation of gabapentin.

References (Vancouver Style)

1. Ferguson RJ, Palmer AJR, Taylor A, Porter ML, Malchau H, Glyn-Jones S. Hip replacement. **Lancet**. 2018;392(10158):1662–1671. doi:10.1016/S0140-6736(18)31777-X.
2. Kurtz S, Ong K, Lau E, Mowat F, Halpern M. Projections of primary and revision hip and knee arthroplasty in the United States from 2005 to 2030. **J Bone Joint Surg Am**. 2007;89(4):780–785. doi:10.2106/JBJS.F.00222.
3. Bashinskaya B, Zimmerman RM, Walcott BP, Antoci V. Arthroplasty utilization in the United States is predicted by age-specific population groups. **ISRN Orthop**. 2012;2012:185938. doi:10.5402/2012/185938.
4. Chan EY, Blyth FM, Cheow SL, Fransen M. Postoperative pain following hospital discharge after knee replacement surgery: a patient survey. **Pain Manag**. 2013;3(3):177–188. doi:10.2217/pmt.13.14.
5. Dimitriou D, Antoniadis A, Flury A, Liebhauser M, Helmy N. Total hip arthroplasty improves the quality-adjusted life years in patients who exceeded the estimated life expectancy. **J Arthroplasty**. 2018;33(11):3484–3489. doi:10.1016/j.arth.2018.07.005.
6. Husted H, Lunn TH, Troelsen A, Gaarn-Larsen L, Kristensen BB, Kehlet H. Why still in hospital after fast-track hip and knee arthroplasty? **Acta Orthop**. 2011;82(6):679–684. doi:10.3109/17453674.2011.636682.
7. Ranawat AS, Ranawat CS. Pain management and accelerated rehabilitation for total hip and total knee arthroplasty. **J Arthroplasty**. 2007;22(7 Suppl 3):12–15. doi:10.1016/j.arth.2007.05.040.
8. Calandre EP, Rico-Villademoros F, Slim M. Alpha-delta ligands, gabapentin, pregabalin and mirogabalin: a review of their clinical pharmacology and therapeutic use. **Expert Rev Neurother**. 2016;16(11):1263–1277. doi:10.1080/14737175.2016.1202764.
9. Peng PW, Wijesundera DN, Li CC. Use of gabapentin for perioperative pain control: a meta-analysis. **Pain Res Manag**. 2007;12(2):85–92. doi:10.1155/2007/840572.
10. Han C, Li XD, Jiang HQ, Ma JX, Ma XL. The use of gabapentin in the management of postoperative pain after total hip arthroplasty: a meta-analysis of randomized controlled trials. **J Orthop Surg Res**. 2016;11(1):79. doi:10.1186/s13018-016-0412-z.
11. Hamilton TW, Strickland LH, Pandit HG. A meta-analysis on the use of gabapentinoids for the treatment of acute postoperative pain following total knee arthroplasty. **J Bone Joint Surg Am**. 2016;98(16):1340–1350. doi:10.2106/JBJS.15.01202.
12. Zhai L, Song Z, Liu K. The effect of gabapentin on acute postoperative pain in patients undergoing total knee arthroplasty: a meta-analysis. **Medicine (Baltimore)**. 2016;95(20):e3673. doi:10.1097/MD.00000000000003673.
13. Clarke HA, Katz J, McCartney CJL, Stratford P, Kennedy D, Pagé MG, et al. Perioperative gabapentin reduces 24-hour opioid consumption and improves in-hospital rehabilitation but not post-discharge outcomes after total knee arthroplasty with peripheral nerve block. **Br J Anaesth**. 2014;113(5):855–864. doi:10.1093/bja/aeu202.

14. Clarke H, Pereira S, Kennedy D, Andrion J, Mitsakakis N, Gollish J, et al. Adding gabapentin to a multimodal regimen does not reduce acute pain, opioid consumption or chronic pain after total hip arthroplasty. **Acta Anaesthesiol Scand**. 2009;53(8):1073–1083. doi:10.1111/j.1399-6576.2009.02039.x.
15. Paul JE, Nantha-Aree M, Buckley N, Shahzad U, Cheng J, Thabane L, et al. Randomized controlled trial of gabapentin as an adjunct to perioperative analgesia in total hip arthroplasty patients. **Can J Anaesth**. 2015;62(5):476–484. doi:10.1007/s12630-014-0310-y.
16. Clarke HA, Pereira S, Kennedy D, Gilron I, Katz J, Gollish J, et al. Gabapentin decreases morphine consumption and improves functional recovery following total knee arthroplasty. **Pain Res Manag**. 2009;14(3):217–222. doi:10.1155/2009/930609.
17. Paul JE, Nantha-Aree M, Buckley N, Cheng J, Thabane L, Tidy A, et al. Gabapentin does not improve multimodal analgesia outcomes for total knee arthroplasty: a randomized controlled trial. **Can J Anaesth**. 2013;60(5):423–431. doi:10.1007/s12630-013-9902-1.
18. Lunn TH, Husted H, Laursen MB, Hansen LT, Kehlet H. Analgesic and sedative effects of perioperative gabapentin in total knee arthroplasty: a randomized, double-blind, placebo-controlled dose-finding study. **Pain**. 2015;156(12):2438–2448. doi:10.1097/j.pain.0000000000000309.
19. Mishriky BM, Waldron NH, Habib AS. Impact of pregabalin on acute and persistent postoperative pain: a systematic review and meta-analysis. **Br J Anaesth**. 2015;114(1):10–31. doi:10.1093/bja/aeu293.