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Effect of Preemptive Gabapentin on Postoperative Analgesia and Rescue Analgesic Requirements in Total Abdominal Hysterectomy

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ABSTRACT

Background: Postoperative pain following total abdominal hysterectomy can lead to increased morbidity, delayed recovery, and higher analgesic requirements. Preemptive analgesia aims to prevent central sensitization caused by surgical trauma. Gabapentin, an anticonvulsant with antihyperalgesic properties, has shown promise in reducing postoperative pain and opioid consumption. This study evaluated the effectiveness of preemptive oral gabapentin in improving postoperative analgesia and reducing rescue analgesic requirements in patients undergoing total abdominal hysterectomy under spinal anaesthesia.

Methods: 30 female patients between the ages of 40 and 60 who had ASA physical status I or II and were undergoing complete abdominal hysterectomy under spinal anaesthesia participated in a prospective, randomised, double-blind trial. Patients were randomly allocated into two groups (n=15 each). Group G received oral gabapentin 300 mg, while Group P received a matching placebo 2 hours before surgery. Postoperative pain was assessed using the VRS (Verbal Rating Scale) at 2, 4, 12, and 24 hours. Morphine 4.5 mg intramuscularly was administered as rescue analgesia when VRS ≥3. Time to first rescue analgesia and total morphine consumption during the first 24 hours were recorded. Statistical analysis was performed using mixed ANOVA and Student's t-test.

Results: Age, weight, ASA status, and length of operation were similar between the two groups. At every postoperative time point, the gabapentin group's VRS ratings were considerably lower ($p<0.001$). Group G's mean time to first rescue analgesia was substantially longer than Group P's (270.0 ± 150.9 vs. 147.5 ± 54.6 minutes; $p=0.006$). Group G consumed considerably less morphine overall in the first 24 hours than Group P (6.3 ± 3.3 mg vs. 13.2 ± 2.7 mg; $p<0.001$).

Conclusion: Preemptive oral gabapentin 300 mg significantly reduces postoperative pain intensity, delays the need for rescue analgesia, and decreases postoperative morphine requirements following total abdominal hysterectomy under spinal anaesthesia. Gabapentin may be considered an effective component of multimodal postoperative pain management.

Keywords: Preemptive Analgesia, Gabapentin, Total Abdominal Hysterectomy, Postoperative Pain, Morphine Consumption, Spinal Anaesthesia, Rescue Analgesia.

INTRODUCTION

Postoperative pain remains a major clinical challenge following abdominal surgeries, including total abdominal hysterectomy. Inadequately managed postoperative pain can delay recovery, prolong hospitalization, impair patient satisfaction, and contribute to increased postoperative morbidity. Effective pain management is therefore an essential component of perioperative care and plays a crucial role in improving surgical outcomes and quality of recovery.[1]

Surgical tissue injury activates peripheral nociceptors and initiates a cascade of inflammatory and neurophysiological events that result in peripheral and central sensitization. Central sensitization leads to an exaggerated response to painful

stimuli and contributes significantly to the development and persistence of postoperative pain.[2] By giving analgesic treatments before the surgical stimulation, the idea of preemptive analgesia was developed to stop or lessen these sensitisation processes. By reducing the establishment of central sensitization, preemptive analgesia has the potential to decrease postoperative pain intensity, reduce analgesic requirements, and improve patient recovery.[3]

Originally created as an antiepileptic medication, gabapentin is a structural analogue of GABA (Gamma-Aminobutyric Acid). Its analgesic, antihyperalgesic, and opioid-sparing qualities have since been extensively studied. It is thought that gabapentin reduces the release of excitatory neurotransmitters involved in nociceptive transmission via binding to the α2δ subunit of voltage-gated calcium channels.[4]

Preoperative gabapentin administration dramatically lowers postoperative pain severity and opiate intake in patients undergoing a variety of surgical procedures, according to prior clinical research. Evidence suggests that gabapentin decreases postoperative analgesic requirements, prolongs the pain-free period, and improves overall analgesic outcomes during the early postoperative period. Studies conducted in patients undergoing total abdominal hysterectomy have also shown reduced pain scores and lower opioid consumption following preoperative oral gabapentin administration. Additionally, the efficacy of perioperative gabapentin in lowering surgical pain and opioid needs while improving postoperative analgesia has been validated by systematic reviews and meta-analyses.[5-8]

Aims and Objectives

The goal of the current study was to evaluate preemptive oral gabapentin affected patients undergoing complete abdominal hysterectomy under spinal anaesthesia in terms of postoperative analgesia and rescue analgesic requirements. The objectives were to assess the intensity of postoperative pain at predetermined intervals, determine the time to first request for rescue analgesia, compare the total postoperative rescue analgesic consumption between the gabapentin and placebo groups, and evaluate the effectiveness of preemptive oral gabapentin as a component of multimodal postoperative pain management.

MATERIALS AND METHODS

Study Design

This was a prospective, randomized, double-blind, placebo-controlled study conducted in the Department of Anaesthesiology and Critical Care, Academy of Medical Sciences, Pariyaram, Kannur, Kerala, over a period of one year from March 2011 to March 2012. The study included 30 female patients scheduled to undergo total abdominal hysterectomy under spinal anaesthesia. Before surgery, eligible patients were divided into two equal groups at random and given either oral gabapentin 300 mg or a placebo. The two groups were evaluated and compared in terms of postoperative pain scores, time to first rescue analgesic necessity, and total rescue analgesic use.

Inclusion and Exclusion Criteria

The study included female patients aged between 40 and 60 years, classified as ASA-PS (American Society of Anesthesiologists Physical Status) I or II, and scheduled to undergo total abdominal hysterectomy under spinal anaesthesia with an expected surgical duration of 1 to 3 hours. Patients were excluded if they had a known allergy to gabapentin, a history of epilepsy, prior treatment with gabapentin within one month preceding surgery, chronic pain syndromes, psychiatric disorders, substance abuse, impaired renal or hepatic function, or had received any analgesic medication within 48 hours before surgery.

Data Collection Procedure

All patients got a thorough preoperative evaluation, which included a medical history, physical examination, and standard laboratory tests, after the acquisition of informed written consent. A random number table was used to divide the eligible patients into two groups of fifteen. Two hours prior to surgery, patients in the gabapentin group were given oral gabapentin 300 mg, while those in the placebo group were given a similar placebo. Thirty minutes before surgery, midazolam 1.5 mg, was administered as a premedication to each patient. Standard monitoring was implemented, which included non-invasive blood pressure, pulse oximetry, electrocardiography, and urine output. After preloading with lactated Ringer's solution (10 mL/kg), 3.4 mL of 0.5% hyperbaric bupivacaine was used to induce spinal anaesthesia at the L3–L4 interspace. An impartial observer who was blind to group assignment evaluated postoperative pain using the verbal rating scale (0–4) at 2, 4, 12, and 24 hours. Rescue analgesia with intramuscular morphine 4.5 mg was administered when the VRS score was ≥3 or upon patient request. The time to first rescue analgesia, total number of morphine boluses, and total morphine consumption during the first 24 postoperative hours were recorded.

Statistical Analysis

SPSS version 9.0 was used for data entry and analysis. The mean ± standard deviation (SD) was used to express continuous variables. Two-factor repeated-measures ANOVA (Analysis of Variance) was used to examine postoperative pain scores recorded at various time intervals. The unpaired Student's t-test was used to compare the mean total morphine consumption between the gabapentin and placebo groups. Statistical significance was defined as a p-value of less than 0.05.

RESULTS

Variable	Gabapentin Group (G) (n=15)	Placebo Group (P) (n=15)	P Value
Age (in years)	42.93 ± 3.67	46.33 ± 11.48	0.284
Table 1. Comparison of Age between the Study Groups			

Table 1 illustrates the comparison of age distribution between the gabapentin and placebo groups. The mean age was 42.93 ± 3.67 years in the gabapentin group and 46.33 ± 11.48 years in the placebo group. The difference was statistically not significant (p=0.284), indicating that both groups were comparable with respect to age.

Variable	Gabapentin Group (G) (n=15)	Placebo Group (P) (n=15)	P Value
Weight (kg)	50.40 ± 6.08	53.67 ± 4.24	0.099
Table 2. Comparison of Weight between the Study Groups			

Table 2 depicts the comparison of body weight between the two groups. The mean body weight was slightly lower in the gabapentin group (50.40 ± 6.08 kg) compared to the placebo group (53.67 ± 4.24 kg), but the difference was not statistically significant (p=0.099). Thus, both groups were comparable in terms of body weight.

ASA Grade	Gabapentin Group n (%)	Placebo Group n (%)	Total n (%)
ASA I	13 (86.7%)	11 (73.3%)	24 (80.0%)
ASA II	2 (13.3%)	4 (26.7%)	6 (20.0%)
Total	15 (100%)	15 (100%)	30 (100%)
Table 3. Distribution of ASA Physical Status			
Fisher's Exact Test p = 0.651			

Table 3 shows the distribution of ASA physical status among study participants. Most patients belonged to ASA Grade I in both groups. The difference in ASA grading between the two groups was not statistically significant (p=0.651), indicating similar baseline health status.

Variable	Gabapentin Group (G)	Placebo Group (P)	P Value
Duration of Surgery (minutes)	123.87 ± 5.91	125.67 ± 20.60	NS
Table 4. Comparison of Duration of Surgery			

Table 4 presents the comparison of surgical duration between the two groups. The mean duration of surgery was 123.87 ± 5.91 minutes in the gabapentin group and 125.67 ± 20.60 minutes in the placebo group. The difference was not statistically significant, confirming procedural comparability between groups.

Time After Surgery	Gabapentin Group (Mean ± SD)	Placebo Group (Mean ± SD)
2 Hours	0.00 ± 0.00	0.73 ± 1.28
4 Hours	0.40 ± 1.06	2.13 ± 1.60
12 Hours	0.60 ± 1.12	2.53 ± 1.51
24 Hours	0.00 ± 0.00	1.27 ± 1.75
Table 5. Post-Operative Verbal Rating Scale (VRS) Scores		
Mixed ANOVA: Treatment Effect p < 0.001		

Table 5 demonstrates postoperative pain intensity measured using the VRS. At every postoperative time point, the gabapentin group's pain assessments were consistently lower. Patients using preoperative gabapentin had better postoperative analgesia, according to a highly significant treatment effect (p<0.001) found by mixed ANOVA.

Source	F Value	P Value
Treatment	27.26	<0.001
Time	7.39	<0.001
Treatment × Time	1.72	0.169
Table 6. Mixed ANOVA Analysis of VRS Scores		

Table 6 summarizes the mixed ANOVA analysis of postoperative pain scores. There was a significant effect of treatment and time on pain levels (p<0.001). However, there was no significant interaction between treatment and time (p=0.169), indicating that gabapentin's favourable effects persisted throughout the postoperative period.

A. Time to First Rescue Analgesia			
Variable	**Gabapentin Group**	**Placebo Group**	**P Value**

Time to First Rescue Analgesia (min)	270.00 ± 150.89	147.53 ± 54.58	0.006
B. Total Morphine Consumption			
Variable	**Gabapentin Group**	**Placebo Group**	**P Value**
Total Morphine Consumption (mg)	6.30 ± 3.32	13.20 ± 2.67	<0.05
Table 7. Rescue Analgesic Requirement			

Table 7 highlights the effect of gabapentin on postoperative rescue analgesic requirements. Patients receiving gabapentin had a significantly longer duration before requesting their first rescue analgesic (270.00 ± 150.89 minutes vs. 147.53 ± 54.58 minutes; p=0.006). Furthermore, total morphine consumption was substantially lower in the gabapentin group (6.30 ± 3.32 mg) compared with the placebo group (13.20 ± 2.67 mg), demonstrating the opioid-sparing effect of preemptive gabapentin.

DISCUSSION

Effect of Preemptive Gabapentin on Postoperative Pain Scores

The present study demonstrated that patients who received oral gabapentin 300 mg before surgery experienced significantly lower postoperative pain scores and prolonged analgesia compared with the placebo group. Patients in the placebo group experienced higher pain intensity and a longer duration of pain following total abdominal hysterectomy.

These findings are consistent with the study conducted by Verma et al. (2008),[9] who evaluated 300 mg oral gabapentin administered two hours before abdominal hysterectomy under combined spinal epidural anaesthesia. They reported significantly lower postoperative VAS scores at 2, 4, 8, 12 and 24 hours in the gabapentin group compared with placebo ($p<0.05$), confirming the analgesic efficacy of preemptive gabapentin.

Similarly, Pandey et al.,[10] observed significantly lower VAS scores at all postoperative intervals (0–24 hours) among lumbar discectomy patients who received preoperative gabapentin 300 mg. The reduction in pain intensity observed in their study closely parallels the findings of the present study, despite differences in surgical procedures.

Effect on Rescue Analgesic Requirement

A major finding of the present study was the significant prolongation in the time to first rescue analgesic requirement. Patients receiving gabapentin required rescue analgesia after 270 ± 150.89 minutes, whereas the placebo group required analgesia after 147.53 ± 54.58 minutes, indicating almost a two-fold increase in pain-free duration.

Comparable findings were reported by Kohli et al.,[11] who studied pregabalin, a gabapentinoid structurally related to gabapentin, in hysterectomy patients. They reported the first rescue analgesic requirement at 202.42 ± 6.77 minutes in the pregabalin 300 mg group compared with 131.38 ± 5.15 minutes in controls. Their findings support the concept that gabapentinoids prolong postoperative analgesia and reduce the need for additional analgesics.

Likewise, Ghai et al.,[12] compared pregabalin and gabapentin in abdominal hysterectomy and found that both drugs significantly prolonged the time to first analgesic request compared with placebo, although pregabalin demonstrated superior efficacy. Nevertheless, gabapentin remained significantly better than placebo, corroborating the present findings.

Opioid-Sparing Effect of Gabapentin

The present study showed reduced rescue morphine requirements in the gabapentin group, indicating a significant opioid-sparing effect. Because lowering opioid use reduces opioid-related side effects like nausea, vomiting, respiratory depression, and drowsiness, this is clinically significant.

Dirks et al.,[5] reported that preoperative gabapentin 1200 mg reduced postoperative morphine consumption from 29 mg to 15 mg after mastectomy ($p<0.0001$). Pain during movement was also significantly reduced. Their results strongly support the opioid-sparing effect observed in the present study.

Similarly, Dierking et al.,[13] demonstrated a 32% reduction in morphine consumption following abdominal hysterectomy among patients receiving perioperative gabapentin. Although they did not observe significant differences in pain scores, the reduction in opioid requirement was substantial and aligns with the present findings.

Furthermore, Turan et al.,[6] reported a 24% reduction in patient-controlled morphine consumption among hysterectomy patients receiving gabapentin 1.2 g/day, confirming the opioid-sparing properties of gabapentin.

Comparison with Tramadol-Based Analgesic Studies

The findings of the present study are also supported by studies using tramadol-based postoperative analgesia.
Parikh et al.,[14] demonstrated significantly lower VAS scores at 0, 2, 4, 6, 12, and 24 hours in patients receiving preoperative gabapentin 600 mg. They also observed a marked reduction in the requirement for rescue diclofenac analgesia

(3 patients versus 14 patients in the placebo group; p=0.004). These observations mirror the reduction in rescue morphine requirement observed in the present study.

Similarly, another abdominal hysterectomy study reported significantly lower postoperative tramadol consumption and pain scores among patients receiving preoperative gabapentin compared with placebo, further supporting the current results.

Mechanism Responsible for Improved Analgesia

The superior analgesic effect observed in the present study can be explained by the antihyperalgesic and antiallodynic properties of gabapentin. By binding to the α2δ subunit of voltage-gated calcium channels, gabapentin attenuates central sensitisation and decreases the release of excitatory neurotransmitters. This lessens the sense of pain following surgery and stops nociceptive signals from being amplified.

Gabapentinoids successfully lower postoperative pain, opioid consumption, and opioid-related side effects, according to Tiippana et al., systematic analysis of randomised controlled studies.[8] Their findings provide strong evidence supporting the mechanism and clinical benefits demonstrated in the present study.

Long-Term Benefits and Prevention of Chronic Pain

An important implication of preemptive gabapentin administration is its potential role in preventing central sensitization and the progression of acute postoperative pain into chronic pain. By reducing postoperative nociceptive input and opioid consumption, gabapentin may contribute to improved long-term outcomes.

Sen et al.,[15] compared gabapentin and ketamine in hysterectomy patients and found that both agents improved early postoperative pain control and reduced opioid consumption. However, gabapentin additionally reduced the incidence of chronic postoperative pain during six months of follow-up, highlighting its preventive analgesic potential.

CONCLUSION

The present study demonstrates that preemptive oral gabapentin 300 mg administered before total abdominal hysterectomy under spinal anaesthesia significantly reduces the intensity and duration of postoperative pain, prolongs the duration of effective postoperative analgesia, and delays the onset of postoperative pain. Patients receiving gabapentin required rescue analgesia later and had reduced opioid consumption during the first 24 hours after surgery, indicating its beneficial opioid-sparing effect. These results imply that gabapentin is a safe and useful part of multimodal analgesic regimens for managing postoperative pain in individuals having a complete abdominal hysterectomy. To confirm these results and determine the best dosage approach, more extensive randomised controlled trials are necessary.

REFERENCES

1. Carr DB, Goudas LC. Acute pain. The Lancet 1999;353(9169):2051-8.
2. Woolf CJ. Evidence for a central component of post-injury pain hypersensitivity. Nature 1983;306(5944):686-8.
3. Kissin I. Preemptive analgesia. Anesthesiology 2000;93(4):1138-44.
4. Rose MA, Kam PC. Gabapentin: pharmacology and its use in pain management. Anaesthesia 2002;57(5):451-62.
5. Dirks J, Fredensborg BB, Christensen D, et al. A randomized study of the effects of single-dose gabapentin versus placebo on postoperative pain and morphine consumption after mastectomy. Anesthesiology 2002;97(3):560-4.
6. Turan A, Karamanlioglu B, Memis D, et al. The analgesic effects of gabapentin after total abdominal hysterectomy. Anesth Analg 2004;98(5):1370-3.
7. Hurley RW, Cohen SP, Williams KA, et al. The analgesic effects of perioperative gabapentin on postoperative pain: a meta-analysis. Reg Anesth Pain Med 2006;31(3):237-47.
8. Tiippana EM, Hamunen K, Kontinen VK, et al. Do surgical patients benefit from perioperative gabapentin/pregabalin? A systematic review of efficacy and safety. Anesth Analg 2007;104(6):1545-56.
9. Verma A, Arya S, Sahu S, et al. To evaluate the role of gabapentin as preemptive analgesic in patients undergoing total abdominal hysterectomy in epidural anaesthesia. Indian J Anaesth 2008;52(4):428-31.
10. Pandey CK, Sahay S, Gupta D, et al. Preemptive gabapentin decreases postoperative pain after lumbar discoidectomy. Can J Anaesth 2004;51(10):986-9.
11. Kohli M, Murali T, Gupta R, et al. Optimization of subarachanoid block by oral pregabalin for hysterectomy. J Anaesthesiol Clin Pharmacol 2011;27(1):101-5.
12. Ghai A, Gupta M, Hooda S, et al. Comparison of pregabalin and gabapentin for postoperative pain following abdominal hysterectomy. Saudi J Anaesth 2011;5(3):252-7.
13. Dierking G, Duedahl TH, Rasmussen ML, et al. Effects of gabapentin on postoperative morphine consumption and pain after abdominal hysterectomy: a randomized, double-blind trial. Acta Anaesthesiol Scand 2004;48(3):322-7.
14. Parikh HG, Dash SK, Upasani CB. Study of the effect of oral gabapentin used as preemptive analgesia to attenuate post-operative pain in patients undergoing abdominal surgery under general anesthesia. Saudi J Anaesth 2010;4(3):137-41.
15. Sen H, Sizlan A, Yanarates O, et al. A comparison of gabapentin and ketamine in acute and chronic pain after hysterectomy. Anesth Analg 2009;109(5):1645-50.