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EFFECT OF USE OF PREOPERATIVE GABAPENTIN FOR REDUCTION OF POSTOPERATIVE OPIOID CONSUMPTION IN PATIENTS UNDERGOING SPINE SURGERIES

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ABSTRACT:
Background: The primary objective of the study is to investigate the effect of a single dose of 600 mg oral gabapentin on morphine consumption and pain in the immediate postoperative period through VAS (Visual Analogue Scale) scores. The secondary objective is to look for the intraoperative hemodynamics, and postoperative complications.

KEYWORD: Gabapentin, Morphine consumption, Postoperative pain, Visual Analogue Scale (VAS), Postoperative analgesia, Intraoperative hemodynamics, Postoperative complications, Multimodal analgesia.

INTRODUCTION

EFFECTIVE postoperative pain management is a cornerstone of recovery following spine surgeries. Traditionally, opioids have been the mainstay for controlling acute postoperative pain [1]. However, their use is associated with significant drawbacks, including tolerance, dependence, respiratory depression, and other adverse effects [2-3]. This has prompted the exploration of multimodal analgesic approaches that incorporate non-opioid agents to reduce opioid requirements and improve patient outcomes.

Preoperative gabapentin has been shown to significantly reduce postoperative opioid consumption and pain intensity in patients undergoing spine surgeries, making it a valuable adjunct in multimodal analgesia strategies. Evidence from meta-analyses highlights its effectiveness within the first 24 hours post-surgery, though somnolence may occur as a side effect. Gabapentin, an anticonvulsant commonly prescribed for neuropathic pain, has gained attention as a preemptive analgesic in surgical settings. Its mechanism involves modulation of calcium channels, thereby reducing excitatory neurotransmitter release and attenuating central sensitization. Several randomized controlled trials and meta-analyses have demonstrated that preoperative administration of gabapentin can significantly reduce postoperative opioid consumption and pain scores in patients undergoing spine surgeries. For instance, a systematic review of 13 randomized trials involving 60 participants found that gabapentin reduced opioid use by approximately 40 mg morphine equivalents within the first 24 hours postoperatively, alongside lower pain scores on the Visual Analog Scale (VAS). Similarly, a broader meta-analysis of 17 trials with 60 patients confirmed reduced consumption of morphine, fentanyl, and tramadol when gabapentin was administered preoperatively, though an increased incidence of somnolence was noted. Use of preoperative gabapentin significantly reduces postoperative opioid consumption: a meta-analysis use of preoperative gabapentin significantly reduces postoperative opioids. The clinical significance of these findings lies in gabapentin's ability to enhance patient comfort, minimize opioid-related adverse effects, and potentially reduce the risk of chronic opioid use. Moreover, gabapentin is inexpensive, well-tolerated, and requires no specialized training for administration, making it a practical option in perioperative pain management protocols. Further the study reveals that necessary multimodal analgesia protocols can enhance patient comfort and reduce opioid-related complications. In the intervening time, to establish optimal dosing regimens and predominantly in assorted surgical populations evaluate long-term outcomes was observed.

Methodology

This is a prospective study that enrolled patients undergoing elective surgeries. Demographic data including age, sex, height, weight and BMI were recorded preoperatively.

Study Design: A randomized, double-blind, placebo-controlled, prospective study conducted at Saveetha Medical College Hospital between January 2025 to June 2025.

Study population: Adult patients undergoing elective spine surgeries.

Inclusion Criteria: Adults aged 30–65 years, ASA physical status I or II.

Exclusion Criteria: Refusal to participate, current use of gabapentin or related medications, allergy to gabapentin, inability to comprehend or communicate pain scores.

Sample Size: 60 patients scheduled for elective spine surgery.

METHODOLOGY

patients were randomised into two groups. Group A received oral Gabapentin 600 mg 1 hour preoperatively and Group B received a placebo. Group allocation was done by the randomly allocated sealed envelope method, and the attending anaesthesiologist was unaware of group allocation. The demographic data of the patients such as age, weight and height were recorded for all patients. Patients were taken to the operation theatre and standard monitors were connected (pulse rate, NIBP, SpO_2, electrocardiography), and pre-anaesthetic values were recorded. Peripheral venous access was obtained and IV fluids administered.

After adequate preoxygenation, patients in both groups were induced with Inj. Fentanyl 2 mcg/kg IV, Inj. Propofol 2 mg/kg IV, and muscle relaxant Inj. Vecuronium 0.1 mg/kg IV. Anaesthesia was maintained with O_2:N_2O – 1:1, Isoflurane 1.5%, and intermittent boluses of Vecuronium. Intraoperatively, Inj. Paracetamol 1 g IV, Inj. Morphine 0.1 mg/kg IV, and Inj. Ketorolac 30 mg IM were given. Both groups were followed postoperatively for 24 hours. Intravenous Morphine 1 mg was administered postoperatively through a PCA pump (CADD 45) in both groups when the VAS score was 4 or greater. No analgesics other than morphine were given postoperatively for 24 hours in either group. The primary outcome measured was total morphine consumption over 24 hours postoperatively. Secondary outcomes measured were total duration of analgesia and other complications.

RESULTS

The mean value of total morphine consumption over the first 24 hours postoperatively in Group A (n=30) was 1.4 mg ± 1.30 and in Group B (n=30) was 4.9 mg ± 1.32, with a mean difference of −2.70 mg and 95% confidence interval (−3.38 to −2.03). Total morphine consumption was 65.8% less in Group A compared with Group B, and this difference was statistically significant ($P < 0.001$). The mean duration of analgesia per person was 11.27 hours longer in Group A compared to Group B, and this difference was also statistically significant ($P < 0.001$). There was no significant difference in intraoperative blood loss between the two groups ($P = 0.393$).

Table 1: Demographic and Surgical Characteristics

Parameter	Group A (n=30)	Group B (n=30)	P value
Age	53.70 ± 10.38	50.20 ± 9.56	0.39
Gender: Male Female	 12 (20%) 18 (30%)	 15 (25%) 15 (25%)	0.43
ASA: I II	 12 (20%) 18 (30%)	 12 (20%) 18 (30%)	1.00
Procedure: TLIF Posterior Stabilisation	 18 (30%) 9 (15%) 3 (5%)	 21 (35%) 9 (15%) 0 (0%)	0.19

Table 2: Postoperative Outcomes

Outcome	Mean ± SD	t value	Mean Difference	95% CI	P value
Total morphine consumption in postop 24 hrs (mg)	Group A: 1.40 ± 1.3 Group B: 4.10 ± 1.32	-7.968	-2.70	-3.38 to -2.03	<0.001
Duration of analgesia (hours)	Group A: 14 ± 6.7 Group B: 3.13 ± 2.21	8.747	11.275	8.67 to 13.86	<0.001
Intraoperative blood loss (ml)	Group A: 515 ± 243 Group B: 565 ± 204	-0.860	-50.00	-58.14 to 166.3	0.393

DISCUSSION

The preliminary design and anticipated outcomes of this study are aligned with a growing body of literature that supports the use of gabapentin as a perioperative adjunct to reduce postoperative opioid consumption. Combination regimens of opioid and non-opioid drugs are used to increase the effects and decrease complications of opioids [4]. Spine surgeries

are known to result in intense postoperative pain due to the involvement of both somatic and neuropathic components. Traditional opioid-based analgesia, though effective, is associated with significant side effects that can delay recovery and impair patient satisfaction.

Gabapentin, by modulating calcium channel activity and reducing excitatory neurotransmitter release, offers a unique mechanism of analgesia that complements opioid action. It acts by binding with the α2-δ protein subunit of presynaptic voltage-gated calcium channels in both the central and peripheral nervous systems, resulting in antinociceptive, antihyperalgesic, and antiallodynic properties [5]. Its role in attenuating central sensitization — a key driver of postoperative pain — is particularly relevant in spine surgeries where tissue manipulation is extensive. This drug causes the release of amino acids in the dorsal horn of the spinal cord and decreases the response to neural inputs, thus reducing or stabilizing the activity of the damaged nerves [9].

In this RCT, we report the effect of preoperative gabapentin on postoperative analgesia in a population of patients undergoing major spine surgery, compared to a group receiving usual care. Compared to Group B, total morphine consumption in the postoperative 24 hours was significantly reduced in Group A, and the duration of analgesia was significantly higher in Group A. This study shows that preoperative gabapentin in major spine surgeries reduces the patient's pain score and narcotic requirement, as well as adverse effects, through multimodal analgesia techniques. Gabapentin also has its own clinical and therapeutic advantages due to its higher levels of drug tolerability and enhanced safety profile. Several well-conducted studies have demonstrated the benefits of gabapentin in the surgical setting. Tiippana et al. (2007) conducted a systematic review and found that perioperative gabapentin significantly reduced opioid consumption and opioid-related side effects, especially in orthopedic and spine surgeries [2]. Clarke et al. (2012) reported a 30–40% reduction in postoperative opioid use and improved early postoperative pain scores following spinal fusion when gabapentin was administered preoperatively [1]. Pandey et al. (2005) showed that a 600 mg dose of gabapentin reduced 24-hour morphine consumption and improved patient comfort after lumbar laminectomy [6]. Turan et al. (2004) demonstrated that gabapentin given before spinal surgery significantly reduced pain scores and opioid requirements in the first 48 hours postoperatively [7]. Dirks et al. (2002) showed improved analgesia after minor surgery with a single preoperative dose of gabapentin, highlighting the drug's preemptive analgesic properties [8]. A comprehensive meta-analysis by Han et al. (2017) analyzed data from randomized controlled trials and concluded that preoperative gabapentin significantly reduced postoperative pain intensity and opioid consumption in patients undergoing spinal surgery, with a reduction in opioid-related adverse events, reinforcing the safety and efficacy of gabapentin in this context [10]. Limitations of this study include a relatively short follow-up period, limiting assessment of chronic post-surgical pain; a single-center design, which may limit generalizability; and potential underdetection of rare adverse effects due to the modest sample size. Despite these limitations, our study seeks to provide evidence for an effective, inexpensive, and safe addition to multimodal analgesia protocols in spine surgery. If findings are confirmed, gabapentin may become a routine part of enhanced recovery pathways.

CONCLUSION

This randomized controlled trial suggests that the administration of preoperative gabapentin is effective in reducing postoperative morphine consumption and provides better analgesia after spine surgeries. Based on existing literature and pharmacological rationale, we anticipate that gabapentin will serve as a valuable adjunct to standard analgesic regimens by significantly lowering morphine requirements in the first 24 hours postoperatively, delaying the time to first analgesic request, and potentially reducing opioid-related adverse effects.

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