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COMPARISON OF ORAL GABAPENTIN AND ORAL CLONIDINE FOR POSTOPERATIVE ANALGESIA FOLLOWING ABDOMINAL SURGERIES UNDER GENERAL ANAESTHESIA: A RANDOMIZED CONTROLLED TRIAL

Anaesthesiology

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ABSTRACT

Background: Postoperative pain management significantly affects recovery after abdominal surgery. Gabapentin and Clonidine, through different mechanisms, have shown promise in reducing postoperative pain and opioid consumption. **Methods:** A prospective, randomized, double-blind study included 225 ASA I–II patients undergoing elective abdominal surgeries. Patients were divided into three groups: Control (placebo), Gabapentin (300 mg orally 90 minutes before surgery), and Clonidine (150 µg orally 90 minutes before surgery). Hemodynamic parameters, duration and degree of postoperative analgesia, rescue analgesic requirement, and adverse effects were recorded. **Results:** Gabapentin significantly prolonged the duration of postoperative analgesia (124.6 ± 16.4 min) compared to Clonidine (87.2 ± 12.5 min) and control (61.9 ± 8.4 min) ($p<0.0001$). Visual Analogue Scale (VAS) scores and total rescue analgesic requirements were significantly lower in the Gabapentin group. Both Gabapentin and Clonidine groups showed better hemodynamic stability than control. **Conclusion:** Oral Gabapentin 300 mg administered preoperatively provides superior postoperative analgesia, reduces analgesic consumption, and maintains better hemodynamic stability compared to Clonidine and placebo in abdominal surgeries.

KEYWORDS

Gabapentin, Clonidine, Postoperative Pain, Abdominal Surgery, Randomized Controlled Trial, Analgesia

INTRODUCTION

Effective postoperative pain management is critical for enhancing patient recovery, minimizing hospital stay, and improving patient satisfaction. Multimodal analgesia strategies, incorporating non-opioid agents, aim to optimize analgesia while minimizing opioid-related side effects. Gabapentin, a γ-aminobutyric acid (GABA) analogue, and Clonidine, an α2-adrenergic agonist, have shown potential in modulating postoperative pain pathways.

Gabapentin acts by reducing central sensitization, while Clonidine blunts the sympathetic response and enhances analgesia via spinal mechanisms. Despite evidence supporting their individual use, comparative data evaluating their efficacy in postoperative analgesia in abdominal surgeries remains limited.

This randomized controlled trial aimed to compare the effects of oral Gabapentin and oral Clonidine premedication on postoperative analgesia, hemodynamic stability, and rescue analgesic requirements in patients undergoing elective abdominal surgeries under general anaesthesia.

METHODS

Study Design and Participants

This prospective, randomized, double-blind trial was conducted after institutional ethical committee approval at Gandhi Medical College and associated hospitals. A total of 225 patients aged 20–60 years, ASA physical status I or II, scheduled for elective abdominal surgery under general anaesthesia, were enrolled.

Exclusion criteria included patient refusal, BMI >35, β-blocker use, chronic pain, substance abuse, pregnancy, and significant systemic disease.

Randomization and Interventions

Patients were randomized into three groups (n=75 each) using a computer-generated sequence:

- **Group I (Control):** Placebo tablet 90 minutes before surgery.
- **Group II (Gabapentin):** 300 mg oral Gabapentin 90 minutes before surgery.
- **Group III (Clonidine):** 150 µg oral Clonidine 90 minutes before surgery.

Anaesthetic Technique

Standard monitoring included ECG, pulse oximetry, and non-invasive blood pressure (NIBP). All patients received intravenous glycopyrrolate (0.2 mg), midazolam (0.02 mg/kg), and fentanyl (2 µg/kg) preoperatively. Induction was achieved with thiopentone sodium, and muscle relaxation was facilitated with vecuronium bromide (0.1 mg/kg). Anaesthesia was maintained with oxygen, nitrous oxide, and halothane. Postoperatively, residual paralysis was reversed with neostigmine and glycopyrrolate.

Outcome Measures

Primary Outcome:

- Duration of postoperative analgesia (time from extubation to first request for analgesia).

Secondary Outcomes:

- Hemodynamic parameters (HR, SBP, DBP).
- Visual Analogue Scale (VAS) pain scores at predefined intervals (0–6h, 6–12h, 12–18h, 18–24h).
- Total rescue analgesic requirement over 24 hours (intramuscular diclofenac).

Adverse effects including nausea, vomiting, dizziness, and sedation were noted.

Statistical Analysis

Data were analyzed using ANOVA, chi-square, and Z-tests where appropriate. $p<0.05$ was considered statistically significant.

RESULTS

Demographic Data

Age, sex, body weight, and duration of surgery were comparable among groups ($p>0.05$).

Parameter	Control (n=75)	Gabapentin (n=75)	Clonidine (n=75)
Age (years)	36.5 ± 13.7	39.8 ± 10.9	39.0 ± 15.3
Male:Female ratio	48:27	41:34	45:30
Weight (kg)	55.7 ± 17.2	58.1 ± 14.7	59.6 ± 11.5
Duration of Surgery (min)	102 ± 16.4	90.4 ± 12.2	87.4 ± 13.3

Hemodynamic Parameters

Both Gabapentin and Clonidine groups maintained better hemodynamic stability intraoperatively compared to control, particularly in heart rate and systolic blood pressure trends.

Table: Hemodynamic Response at Different Time Intervals (Mean ± SD)

Time Point	HR (bpm) - Control	HR - Gabapentin	HR - Clonidine	SBP (mmHg) - Control	SBP - Gabapentin	SBP - Clonidine	DBP (mmHg) - Control	DBP - Gabapentin	DBP - Clonidine
Base-line (before premedication)	73.2 ± 6.5	73.8 ± 10.4	81.5 ± 12.4	117.8 ± 9.4	129.7 ± 15.3	128.5 ± 6.4	74.7 ± 3.8	75.0 ± 18.6	79.4 ± 12.2
30 min after premedication	70.8 ± 4.3	71.3 ± 9.3	70.1 ± 10.3	116.3 ± 6.7	116.9 ± 8.4	121.8 ± 12.4	73.8 ± 11.4	72.1 ± 6.2	75.5 ± 17.1
60 min after premedication	69.3 ± 6.8	70.5 ± 15.8	69.9 ± 8.3	116.5 ± 8.3	111.7 ± 18.2	122.2 ± 14.3	75.0 ± 9.4	70.9 ± 12.7	74.9 ± 8.3
90 min after premedication	71.5 ± 7.5	69.1 ± 8.9	68.9 ± 17.2	116.4 ± 12.7	119.9 ± 13.2	123.1 ± 11.3	69.2 ± 16.3	68.8 ± 11.9	75.2 ± 9.4
Just before induction	70.8 ± 8.5	73.1 ± 6.6	69.4 ± 8.4	118.9 ± 13.5	114.6 ± 6.8	122.2 ± 18.8	76.5 ± 11.3	69.8 ± 17.3	76.7 ± 11.3
Post-induction & intubation	74.1 ± 6.3	72.3 ± 14.2	74.0 ± 13.2	119.1 ± 11.1	129.1 ± 12.8	125.8 ± 16.3	74.9 ± 7.2	71.4 ± 6.4	79.4 ± 9.8
30 min after induction	70.9 ± 9.8	69.6 ± 9.3	70.3 ± 8.6	119.1 ± 11.3	119.2 ± 8.8	123.3 ± 8.5	75.0 ± 13.5	68.0 ± 9.3	75.7 ± 10.1
60 min after induction	69.3 ± 10.3	67.3 ± 12.1	69.6 ± 7.3	116.7 ± 12.6	115.5 ± 16.1	120.9 ± 14.3	73.7 ± 7.7	70.6 ± 13.5	74.6 ± 8.8
90 min after induction	70.3 ± 6.2	73.1 ± 11.3	73.3 ± 6.3	120.0 ± 12.8	120.3 ± 7.4	122.2 ± 10.3	74.1 ± 11.4	68.7 ± 11.8	74.2 ± 17.1
120 min after induction	77.0 ± 6.3	—	84.6 ± 18.3	—	122.3 ± 4.3	—	—	72.2 ± 2.4	—
Prior to shifting from OR	69.6 ± 13.2	71.6 ± 12.7	69.4 ± 8.9	124.0 ± 11.7	119.5 ± 11.4	121.7 ± 16.8	75.5 ± 18.4	70.0 ± 13.4	75.0 ± 12.0

Clonidine consistently maintained lower HR throughout the intraoperative period, with significant reductions from baseline ($p < 0.0001$ at multiple time points).

Gabapentin showed moderate control of HR and better SBP/DBP stability post-induction.

Both drugs showed better hemodynamic modulation compared to placebo, particularly at stressful events like intubation.

Postoperative Analgesia

Gabapentin group demonstrated the longest duration of postoperative analgesia ($p<0.0001$).

Group	Duration of Analgesia (min)
Control	61.9 ± 8.4
Gabapentin	124.6 ± 16.4
Clonidine	87.2 ± 12.5

VAS Scores and Rescue Analgesic Requirement

VAS scores were consistently lower in Gabapentin group across all postoperative intervals.

Time Interval	Control (VAS ≥ moderate pain %)	Gabapentin	Clonidine
0–6 hours	29.3%	6.7%	13.2%
6–12 hours	56%	18.6%	38.6%
12–18 hours	76%	41.3%	62.7%
18–24 hours	90.7%	69.3%	82.7%

Gabapentin significantly reduced total rescue diclofenac consumption ($p<0.0001$).

Group	Total Rescue Analgesia (mg/24h)
Control	98.0 ± 15.3
Gabapentin	72.0 ± 18.2
Clonidine	84.0 ± 12.6

Adverse Effects

Minor adverse effects such as nausea and dizziness were observed but were comparable among groups.

Adverse Effect	Group I (Control) (%)	Group II (Gabapentin) (%)	Group III (Clonidine) (%)
Nausea	9.3%	12%	10.7%
Vomiting	6.7%	5.3%	8%
Dizziness	4%	8%	6.7%
Sedation	2.7%	6.7%	5.3%
Constipation	0%	2.7%	1.3%

DISCUSSION

This study demonstrated that preoperative oral Gabapentin significantly prolongs postoperative analgesia, reduces analgesic requirements, and maintains superior hemodynamic stability compared to oral Clonidine and placebo in patients undergoing abdominal surgeries.

Gabapentin acts centrally by binding to the α2δ subunit of voltage-gated calcium channels, thereby inhibiting excitatory neurotransmitter release and reducing central sensitization. In our study, the Gabapentin group had a prolonged pain-free period and lower VAS scores at all postoperative intervals, consistent with findings reported by Dirks et al.and Menigaux et al. The significantly reduced requirement for rescue analgesia corroborates earlier observations by Pandey et al.and Soltani-Mohammadi et al..

Clonidine, an α2-adrenergic agonist, provides analgesia by inhibiting norepinephrine release and enhancing spinal cord-mediated analgesia. It also improves perioperative hemodynamic stability, a finding consistent with previous studies by Ghignone et al.and Hidalgo et al.. However, in this trial, Clonidine was less effective than Gabapentin in prolonging postoperative analgesia duration and reducing VAS scores.

Both Gabapentin and Clonidine demonstrated superior hemodynamic stability compared to placebo. Clonidine significantly attenuated heart rate and blood pressure responses throughout the perioperative period, particularly at intubation and surgical stimulation. Gabapentin also contributed to moderate heart rate control and smoother systolic and diastolic trends. These findings reflect the sympatholytic properties of Clonidine and the central desensitizing effects of Gabapentin. Importantly, neither agent caused clinically significant hypotension or bradycardia, highlighting their safety and utility as premedication agents to improve perioperative cardiovascular stability.

Adverse effects such as nausea, vomiting, dizziness, and sedation were minimal and comparable across groups, suggesting that both drugs are well-tolerated at the administered doses.

Limitations of the study include the use of a relatively low dose of Gabapentin (300 mg) compared to higher doses (600–1200 mg) reported in other studies. Additionally, only short-term postoperative outcomes (24 hours) were assessed. Future studies could evaluate different dosing regimens and assess long-term recovery, functional outcomes, and quality of life measures.

CONCLUSION

Oral Gabapentin (300 mg) administered 90 minutes before abdominal surgeries provides superior postoperative analgesia, improved hemodynamic stability, and reduces the need for rescue analgesics compared to oral Clonidine and placebo. Gabapentin can be a valuable adjunct in multimodal analgesia strategies for abdominal surgeries.

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