SHORT COMMUNICATION

Assessing the Adjuvant Efficacy of Oral Gabapentin to Balanced Anaesthesia for Elective Surgeries in Dogs

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Abstract

Oral gabapentin has been increasingly explored for its anaesthetic sparing properties in veterinary anesthesia. This study aimed to evaluate the efficacy of oral gabapentin as an adjunct in balanced anaesthesia in dogs undergoing elective surgeries, with a focus on its reduction in anaesthetic requirements. A total of 20 dogs brought for elective surgeries were selected and the selected animals were divided into two groups of 10 animals each, *viz.,* group I and group II. Group II animals received oral gabapentin (10 mg/kg) as premedicant twice a day for two days before the surgery and one dose, 2 h before the surgery. Both groups were pre-medicated with dexmedetomidine and butorphanol, followed by induction with diazepam and ketamine and maintenance with isoflurane. Isoflurane concentrations were measured continuously during the surgical procedure. The gabapentin group showed a significant reduction in isoflurane requirements compared to the control group ($p<0.05$) indicating a notable isoflurane-sparing effect (57.34%). Oral gabapentin effectively reduces the requirement for isoflurane and provides superior analgesia in dogs undergoing elective surgeries. These findings support its use as an adjunctive agent in balanced anesthesia, offering both clinical and economic advantages.

Keywords: Balanced anesthesia, Dog, Elective surgeries, Gabapentin, Isoflurane.

Ind J Vet Sci and Biotech (2025): 10.48165/ijvsbt.21.1.24

Introduction

Effective anesthesia is crucial for animal welfare during surgeries with balanced anaesthesia combining multiple drugs for sedation, muscle relaxation, analgesia and unconsciousness. Isoflurane is a common inhalant anesthetic but can cause dose-dependent cardiovascular and respiratory depression. To mitigate this, adjuncts like gabapentin are increasingly used. Research supports gabapentin's potential to reduce isoflurane use offering both clinical and economic benefits (González, 2020). So, this study was planned to assess the adjuvant efficacy of oral gabapentin to balanced anaesthesia for elective surgeries in dogs.

Materials and Methods

This clinical study on 20 dogs was carried out at Small Animal Surgery Unit, Department of Veterinary Surgery and Radiology, Veterinary College and Research Institute, Orathanadu, Tamil Nadu, during January 2024 to November 2024. The study followed a randomized controlled design, with twenty dogs brought for elective surgeries divided into two groups of 10 animals each: a control group (group I) and a gabapentin-treated group (group II). Detailed clinical examination of all the animals selected for the study was carried out. Haematology and serum biochemical analysis were performed on all patients to assess their overall health status prior to the procedure as per recommendations made by McMillan (2003) and Mathews and Greens (2015). Pre-anaesthetic screening with special diagnostic techniques, *viz.,* radiography, and ultrasonography were done to categorize the physical status of the patient. In all the animals, food and water were withheld for 12 h and 6 h, respectively, prior to induction of anaesthesia.

Cephalic vein was cannulated with intravenous cannula and secured *in-situ* using Micropore surgical tape to facilitate

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How to cite this article: Rajesh, C., Vishnugurubaran, D., Jayakumar, K., Vijayakaran, K., Kaarthick, D., & Thabsheera, A. (2025). Assessing the Adjuvant Efficacy of Oral Gabapentin to Balanced Anaesthesia for Elective Surgeries in Dogs. Ind J Vet Sci and Biotech. 21(1), 118-120.

Source of support: Nil

Conflict of interest: None

Submitted 20/11/2024 **Accepted** 19/12/2024 **Published** 10/01/2025

administration of drugs and maintenance of fluids. The surgical site was shaved and prepared aseptically.

The animals in group I were pre-medicated with dexmedetomidine @ 2 µg/kg body weight, and inj. Butorphanol @ 0.1 mg/kg body weight, i/v. The anaesthesia was induced with inj. Diazepam @ 0.5 mg/kg body weight and inj. Ketamine @ 5 mg/kg body weight given i/v. Oro-endotracheal intubation was done with desired size of Murphy eye endotracheal tube and anaesthesia was maintained with isoflurane using FGF 20 mL/kg body weight and variable vaporizer setting.

The cardiopulmonary, haemato-biochemical and anaesthetic parameters were monitored continuously throughout the intra-operative period. The quantity of isoflurane used was calculated using Avogadro's principle. Isoflurane utilization was calculated based on fresh gas flow (FGF) rate.

The experimental data were presented as mean ±SE. Statistical analysis revealing p value ≤0.05 and ≤0.01 were considered statistically 'significant' and 'highly significant', respectively (Snedecor and Cochran, 1994).

Results And Discussion

The mean (±SE) fresh gas flow rate (mL/kg/min), average vaporizer setting (%), isoflurane liquid utilized for 30 kg and 1 h basis during low flow isoflurane anaesthesia (mL) and cost of isoflurane utilized (Rs.) for 30 kg and 1 h during isoflurane anaesthesia were calculated using Avogadro principle and the results are shown in Table 1.

There was no significant difference noticed in the average fresh gas flow rate (mL/kg/min) between the two groups. However, a highly significant difference ($p<0.01$) was observed in the mean (±SE) vaporizer setting, which was 1.43 ± 0.14% for group I and 0.82 ± 0.09% for group II. This lower vaporizer setting in group II suggests that the animals premedicated with gabapentin required less isoflurane maintaining an adequate depth of anaesthesia. Gabapentin's sedative and analgesic properties likely contributed to a reduced need for volatile anaesthetic, making it an effective adjuvant in minimizing isoflurane consumption (Dahlgren *et al*., 2012). There was 57.34 % reduction in the average vaporizer setting in group II animals compared to group I animals and this evident the isoflurane sparing effect of gabapentin in dogs

The mean (±SE) isoflurane liquid utilized in mL per 30 kg and 1-h duration was 3.39 ± 0.68 for group I and 2.59 ± 0.39 for group II, showing a non-significant difference in the amount of isoflurane used. This was consistent with the lower vaporizer settings in group II, further reinforcing the isoflurane-sparing effect of gabapentin (Marx *et al*., 2015). Reducing isoflurane consumption has clinical and financial benefits, as it not only minimizes potential anaesthetic-related side effects but also lowers the overall cost of anaesthesia (González, 2020; Vigneshwaran *et al*. 2021; Vishnugurubaran *et al*., 2024).

In terms of cost, the mean (±SE) cost of isoflurane utilized per 30 kg and 1-h duration of anaesthesia was Rs. 27.12 ± 5.58 for group I and Rs. 20.72 ± 3.15 for group II, with a non-significant difference between the groups. The reduction in isoflurane consumption directly translated into cost savings, making the use of Gabapentin a more economical option for balanced anesthesia protocols (Steffey *et al*., 2015).

The quality of anesthetic recovery was smooth in all the animals subjected to anaesthetic protocol. Animals in group II which received gabapentin demonstrated calm and controlled recoveries with minimal signs of stress or discomfort. In contrast, postoperative delirium was recorded in the animal that did not receive gabapentin premedication (group I). Delirium, often characterized by disorientation, vocalization, and restlessness, can be a distressing complication post-surgery, not only increasing the risk of injury but also elevating physiological stress, which may delay recovery.

Gabapentin's isoflurane-sparing effect not only enhances the quality of anesthesia by reducing the requirement for volatile anesthetics but also offers a cost-effective solution for veterinary surgeries. This benefit was especially relevant in large-scale operations or practices where anaesthetic costs could accumulate highlighting Gabapentin as a valuable addition to multimodal anaesthesia protocols.

In conclusion, animals premedicated with gabapentin had faster recovery times and required significantly less isoflurane with a 57.34% reduction compared to routine control anaesthetic protocol. Although the cost savings from reduced isoflurane use were not statistically significant the findings highlight gabapentin's potential economic benefit in anesthesia protocols for elective surgeries.

Acknowledgement

Thanks are due to the Professor and Head, Veterinary Clinical Complex, and the Dean, Veterinary College and Research Institute, Orathanadu for providing necessary funds and facilities during the research.

Table 1: Mean (±SE) values of anaesthetic parameters observed in routine control and oral gabapentin as an adjunct for balanced anaesthesia in dogs

Anaesthetic parameters	Average fresh gas flow rate (mL/kg/min)	Average vaporizer setting (%)	Isoflurane liquid utilized equated to 30 kg and 1-h duration (mL)	Cost of Isoflurane liquid utilized equated to 30 kg and 1-h duration (Rs)
GROUP I	53.90±9.37	$1.43±0.14^{P}$	3.39±0.68	27.12±5.58
GROUP II	64.58±6.75	$0.82±0.09^{Q}$	2.59±0.39	20.72±3.15

Column-wise group means with different superscript (P,Q) differ highly significant at $p<0.01$.

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