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Research Article

Efficacy of Oral Gabapentin and Intravenous Paracetamol for Postoperative Analgesia in Laparoscopic Surgeries: A Prospective Randomised Double Blind Study

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ABSTRACT

Background: Post-operative pain is a matter of great concern for anaesthesiologists and surgeons. We compared the efficacy of oral Gabapentin and intravenous Paracetamol for postoperative analgesia in patients undergoing laparoscopic surgeries.

Methods: After obtaining written informed consent and ethical committee approval, a total of 70 patients undergoing laporoscopic surgeries were randomly allocated into two groups- 35 patients included in Group A were given 600 mg oral Gabapentin 2 hours before the surgery and Group B patients were given 1gm I.V. PCM 30 minutes before the surgery. The NRS scores at 30 min, 2 hours, 6 hours, 8 hours, 12 hours, and 24 hours were recorded. The time at which first rescue analgesic given and Different hemodynamic parameters like heart rate, blood pressure and oxygen saturation were also recorded at different time intervals.

Results: NRS scores and MAP was higher in Group B with a significant p-value at 8 and 12 hours. The need of first rescue analgesic required was at 7.79±3.49 hours in Group A. In Group B requirement of first rescue analgesia was at 6.09±2.75 hrs. The total dose of tramadol used was significantly higher in Group B with mean 92.86±36.67 than Group A 64.29±28.62 with statistically significant p-value (p=0.001).

Conclusion: Both oral Gabapentin and intravenous Paracetamol are effective modes of postoperative analgesia hence both can be used as preemptive analgesic agents. Oral Gabapentin has a longer duration of action up to 12 hours in the postoperative period while intravenous Paracetamol is effective up to 6 hours postoperatively.

Laparoscopic surgery also known as minimal invasive surgery is a modern surgical technique commonly performed nowadays in the abdomen or pelvis through small incisions with the help of camera. A Laparoscopic surgery closer to the diaphragm has shown to cause more pain and discomfort than that following maneuver at lower site in the abdomen [1]. Pain is considered as an irresistible sensory and emotional feeling associated with a real or potential tissue injury (International Study of Association of Pain 1979) [2]. Efficient pain control is important to prevent the outcomes such as hypertension, tachycardia, myocardial ischemia and respiratory impairment. If the patient's pain is not relieved it will definitely affect his/her sleep, physical functioning and can have a negative impact on patient's wellbeing at many levels [3]. Gabapentin was initially introduced as an anti-epileptic medicine but the doses required to produce anti-convulsing effect was very huge about 1800mg/day. Gabapentin, a structural analogue of GABA, is a water-soluble, bitter-tasting, white crystalline substance with a structure resembling GABA with a cyclohexane ring incorporated [4]. This usually causes sedation/skin rashes/ataxia to the patient. Later it was found to reduce pain in different studies in

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reduced doses and hence used for chronic neuropathic pain as a first line drug. Following laparoscopic cholecystectomy, Gabapentin has been used for pain control in patients without conclusive results [2-3].

Paracetamol, in combination with opioids, has been effectively used for its analgesic effects [4]. IV formulation of acetaminophen, for management of mild-to-moderate pain, moderate-to-severe pain with adjunctive analgesics and reduction of fever, has been approved in the United States 2010. Moreover, intravenous form provides higher and quicker peak plasma and cerebrospinal fluid drug concentrations in comparison to oral or rectal dosing [5].

Numerical rating scale is the simplest and commonly used scales. The patients pick a number to describe pain on a numeric scale (most commonly 0 to 10 with 0 being no pain and 10 being the worst imaginable pain) [6-7].

The purpose of this study is to determine whether preoperative treatment with oral Gabapentin and intravenous paracetamol is associated with lower pain scores, total opioid consumption, decrease length of hospital stay, pre/postoperative anxiolytics need, decrease autonomic response to intubation and decrease post-operative nausea and vomiting (PONV) following laparoscopic surgeries.

Methods

The present study was conducted in the Department of Anaesthesia, MMIMSR after acquiring approval from the Institutional Ethical committee, over a period of one year (2020 - 2021). The study was done in 70 patients of either sex, ASA grade 1 and 2 and age group between 20-60 years. Patients with significant coagulopathies, pregnant patients, and patients with allergic reaction to drugs, patients with hypertension, liver and renal disease were excluded from the study. Patients were allocated in 2 groups:

Group A: received 600mg of oral gabapentin 2 hours before the surgery in preoperative period.

Group B: received IV infusion of 1 gram of paracetamol 30 minutes before surgery preoperatively.

Preanesthetic evaluation was performed and all the necessary investigations were done. A written informed consent was taken. All the patients were kept fasting for solids till 6 hours and upto 2 hours for clear liquids and adviced Tablet alprax 0.25 mg and Tablet Rantac 150 mg orally to be given night before and on morning of surgery.

On the day of surgery, patient's baseline vitals were noted and I.V line was secured with 18/20 G cannula and Intravenous fluid 500ml ringer lactate was started. Group A patients were given 600mg of oral Gabapentin two hours before surgery while Group B patients were given 1 g Intravenous PCM 30 minutes before the operation. On the OT table, monitors were attached and baseline heart rate, blood pressure and oxygen saturation, electrocardiogram and core temperature (by placing temperature probe in nasopharynx) was recorded and then measured at 15 minute time interval till the end of surgery.

Once the vitals were stable, patients were preoxygenated with 100% oxygen using face mask for 3 minutes. Anaesthesia was induced with Injection Propofol (2 mg/kg). Thereafter neuromuscular blockage was achieved with injection Scoline (1 mg/kg). Ventilation was done with face mask for 45 to 60 seconds to allow the jaw to fully relax before the insertion of endotracheal tube. The patient was maintained on Isoflurane with 60% nitrous-oxygen and intermittent boluses of atracurium. At the end of surgery, patient was extubated and shifted to post anesthetic care unit for evaluation. Rescue analgesia was given when NRS scores goes more than 4/10 with Injection Tramadol 50 mg in all the patients. All the patients were observed for 1 hour in post anaesthesia care unit (PACU) before shifting to the ward. On arrival in PACU, vital signs (saturation, pulse rate, blood pressure) were recorded and oxygen was given with facemask for 1-2 hours. Our primary aim was to assess postoperative pain. After 30 minutes, when patients were alert and comfortable they were asked questions regarding their intensity of pain based on NRS score between 0- that is no pain to 10 -that is worst possible pain and their vital signs were also recorded. After that patients were shifted to the ward. In the ward, patients of respective two groups were observed for postoperative pain at 2 hours, 6 hours, 8 hours, 12 hours, and upto 24 hours in postoperative period.

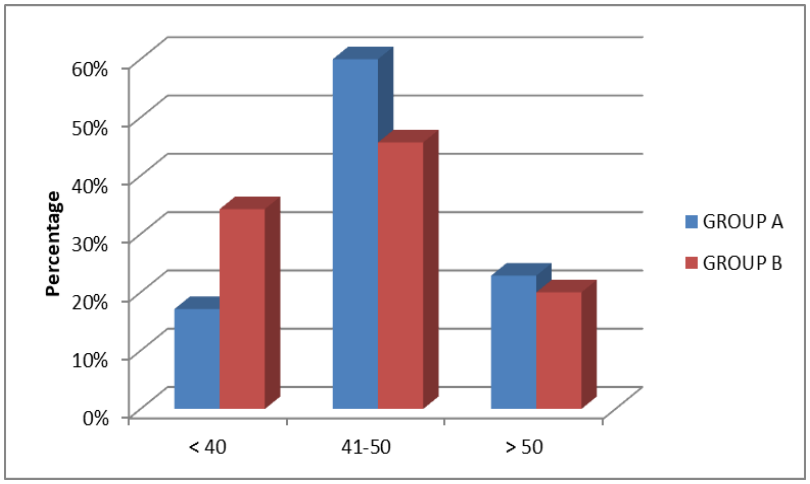
Statistical analysis

Data were described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. To determine whether the data were normally distributed, a Kolmogorov-Smirnov test was used. Comparison of quantitative variables between the study groups was done using Student t-test and Mann Whitney U test for independent samples for parametric and non-parametric data respectively. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using (Statistical Package for the Social Science) SPSS 21version (SPSS Inc., Chicago, IL, USA) statistical program for Microsoft Windows.

Results

The study comprised of 70 patients scheduled for laparoscopic procedures under general anesthesia. They were randomly allocated into 2 groups. Group A patients received 600 mg of oral gabapentin, and Group B patients received 1 gram intravenous paracetamol preoperatively. All patients were comparable in age, sex and ASA grade (Figure 1).

Figure 1- Age wise distribution of patients



Analgesics were given in the form of Injection Tramadol 50 mg in both the groups on demand and when the NRS score was more than or equal to 4.

The need for rescue analgesia was found to be significantly higher in Group B as compared to Group A. The need for rescue analgesic in both the groups was found comparable at 30 min, 2 hours, and 6 hours. But the need of rescue analgesia was significantly higher at 8 hours and 12 hours in group B after the surgery (p-value<0.05) (Figure 2).

Adverse Reaction was not noted in any of the groups as shown in (Table 1).

Figure 2- Comparison of Demand of Rescue in Both the Groups

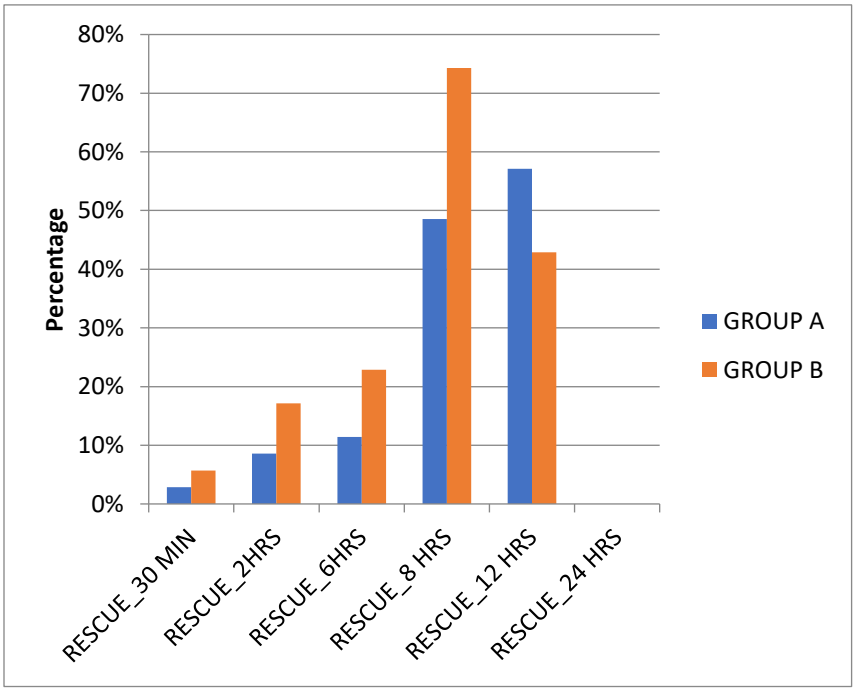


Table1- Adverse reactions in Both Groups

		Group A		Group B		Total
ADVERSE REACTION	Nil	35	100%	35	100%	70
Total		35	100%	35	100%	70

NRS score was found to be higher in Group B at all intervals of time and the results were statistically significant at 8 and 12 hours (P value<0.05) (Figure 3).

Figure 3- Numerical Rating Scale in Both the Groups

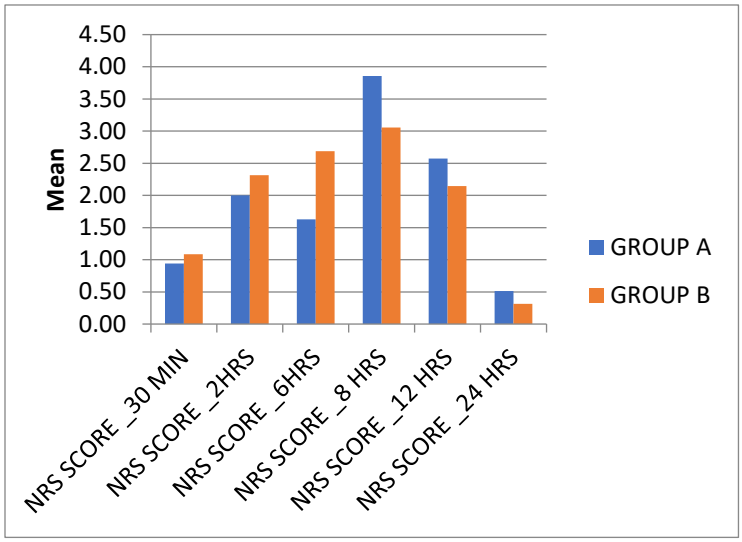
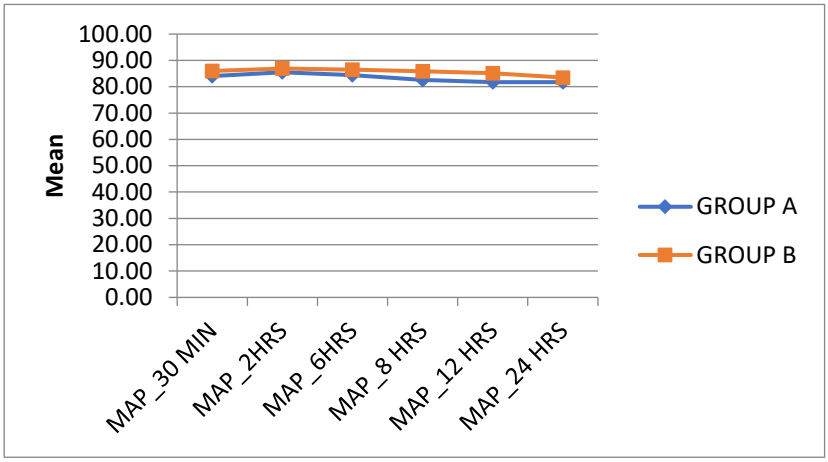


Figure 4- Comparison of mean arterial pressure in both the groups



MAP in group B was higher than Group A with significant p-value at 8 and 12 hours (p=0.037, p=0.026) and were found comparable in the two groups at 30 minutes, 2 hours, 6 hours (p>0.05) (Figure 4).

The need of first rescue analgesic required was at 7.79±3.49 hours in Group A. In Group B requirement of first rescue analgesia was at 6.09±2.75 hours. The p-value was found to be statistically significant (p=0.027) As shown in (Table 2).

The total dose of tramadol consumed was significantly higher in Group B with mean 92.86±36.67 than Group A 64.29±28.62 with statistically significant p-value (p=0.001) as shown in (Table 3).

Table 2- Comparison of need of first rescue analgesia

	Group A Mean	SD	Group B Mean	SD	t	P value
First rescue analgesia requirement (hrs.)	7.79	3.49	6.09	2.75	2.264	0.027

Table 3- Comparison of total dose of tramadol consumed

	Group A Mean	SD	Group B Mean	SD	Z	P value
Total Dose of Tramadol Consumed	64.29	28.62	92.86	36.67	-3.634	0.001

Discussion

Preemptive analgesia includes delivery of an analgesic regimen before the onset of noxious stimuli with the goal of preventing sensitization of the nervous system to subsequent stimuli that could aggravate the pain [8]. As a preemptive analgesic agent both Gabapentin and Paracetamol have shown their effectiveness in clinical trials in acute postoperative pain management [9].

Our prospective randomized study aimed at comparing the efficacy of oral 600 mg Gabapentin given 2 hours before the surgery and intravenous 1 gram. Paracetamol given 30 minutes before the surgery to determine the duration of pain relief after laparoscopic surgery and the time interval at which the rescue analgesia was given on basis of NRS scores and to record any adverse effects if any. Different hemodynamic parameters like oxygen saturation, heart rate and mean arterial pressure were also observed.

In our study group, we found that mean age among different groups was same. ($p>0.05$). NRS scores were comparable among the two groups for the initial 6 hours then NRS scores at 8 and 12 hours in the Paracetamol group were higher with mean values 4.09 and 3.40 respectively when compared to the Gabapentin group where the mean value was 3.00 and 2.46 respectively. P-value was also found to be significant at 8 and 12 hrs. ($p=0.005$, $p=0.006$). The higher NRS scores in PCM group were associated with higher mean arterial pressure at 8 and 12 hours in that group. On comparing NRS scores in two groups over a period of 24 hours, the data was significant after 6 hrs. It was concluded that Gabapentin has long duration of action as compared to paracetamol and leads to effective pain relief in postoperative period.

Mean arterial pressure was comparable up to 6 hrs. At 8 and 12 hours, it was higher in the PCM group with a mean of 85.83 at 8 hours and 85.17 at 12 hours. With significant p-value ($p=0.037$, $p=0.026$). Mean heart rate among Gabapentin and Paracetamol group were comparable up to 8 hours postoperatively, then heart rate was found to be higher in PCM group with a mean value of 85.94 at 12 hrs. And 85.71 at 24 hours with significant p-value ($p=0.013$, $p=0.042$).

On comparing the two groups, it was concluded that changes in mean arterial pressure and heart rate were significant at or more than 8 hours in postoperative period suggesting that pain relief in Gabapentin group was better and extend for 12 hours in the postoperative period while Paracetamol was better in the initial 6 hours of postoperative period.

Saturation of oxygen among two groups showed insignificant p-value at all interval of time postoperatively, although mean value at 30 min and 2 hours was lower in the Gabapentin group (mean=97.34, mean=98.54). Few lower readings in saturation were attributed to sedation effect caused by Gabapentin.

Total dose of tramadol as a rescue analgesic agent consumed was higher in the PCM group with a mean value of 92.86±36.67 when compared to the Gabapentin group where the mean value was 64.29±28.62 with significant p-value ($p=0.001$). The time at which the first rescue analgesia needed was longer in Gabapentin group with mean value of 7.79+-3.49 as compared to the PCM group where mean value was 6.09+-2.75 with significant p-value ($p=0.027$).

Similarly, Bhardwaj et al. in the year 2019 studied the effect of 300 mg Gabapentin, 100 mg Tramadol, and placebo given 2 hours before surgery, on postoperative pain relief after laparoscopic cholecystectomy [10]. They concluded that VAS scores among Gabapentin and Tramadol groups were comparable for the initial 6 hours postoperatively after that the mean VAS score was higher in Tramadol group as compared to Gabapentin group and the p-value was statistically significant. It was concluded that Gabapentin was better in pain relief while Tramadol was comparable to Gabapentin only in the initial 6 hours postoperatively. Systolic blood pressure in Gabapentin and Tramadol groups was comparable up to 6 hours and the p-value was significant at 8, 12, and 15 hr. On comparing Gabapentin and Tramadol group it was concluded that the pain relief was better in Gabapentin group while Tramadol was better in the initial 10 hours of postoperative period.

Pandey CK et.al [11] recorded similar findings with respect to hemodynamic changes in the postoperative period. In addition, he observed that at all intervals of time Gabapentin had lower pain scores in comparison to tramadol and placebo. The requirement of fentanyl as a rescue analgesic agent was lower in the Gabapentin group than the other two groups similar to our study.

Fassoulaki A et. al in the year 2002, observed the analgesic effect of gabapentin for breast cancer surgery. It was found that Gabapentin reduces pain scores up to the fifth postoperative day and the need for fentanyl was significantly lower in the gabapentin group. Gabapentin and Tramadol group were similar in pain relief till 6 hours in postoperative period after which gabapentin was found to be better [12].

Khan Ahmad in the year 2015 did a comparative study showing the efficacy of I.V. PCM as a preemptive analgesic agent in laparoscopic surgery [13]. Group A received PCM 10 min. before the incision while Group B received PCM at the end of surgery. It was observed that the time to first analgesic requirement was significantly longer in Group A as compared to Group B and Group A had significantly lower total analgesic consumption and VAS score. In our study also, we found similar results.

Conclusion

From the present study it can be concluded that both oral Gabapentin and intravenous Paracetamol are different modes of postoperative analgesia, hence both can be used as a pre-emptive analgesic agent for postoperative relief of pain. Although Gabapentin has longer duration of action as compared to Paracetamol, both provides the effective supplements as a part of multimodal analgesia, has better hemodynamic stability, are safe, and cost effective and effectively reduces the pain and the need for opioids and NSAIDs (analgesic requirement).

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