

Efficacy of Intravenous Tramadol vs Paracetamol Infusion for Postoperative Pain in Patients Undergoing Laparoscopic Surgery: A Single - Blinded Randomised Comparative Study

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Abstract: ***Aim:** To compare the postoperative analgesic efficacy of IV paracetamol and IV tramadol in patients undergoing laparoscopic surgery. **Study Design:** Prospective, Single Blinded, Randomised Comparative. **Setting:** Operating Room, Post Operative Room and Surgery Ward of a University Hospital. **Patients:** 100 ASA physical status I and II patients of age 20 - 60 scheduled for laparoscopic surgeries were included. **Interventions:** Subjects were premedicated with oral Ranitidine 150mg and Alprazolam 0.25mg/kg 1 night prior to the surgery and patient was kept nil per oral. Patients were randomized in two groups after inducing anesthesia. The Paracetamol (P) group (n= 50) received 20 mg/kg of IV paracetamol and tramadol (T) group (n=50) received 2mg/kg of IV tramadol. All patients received first dose of study drug at the end of surgery during skin suturing. **Measurements:** Hemodynamic parameters like Heart Rate, Blood Pressure, Oxygen Saturation and pain score using VAS scale were recorded at baseline, 15 minutes, 30 minutes, 1 hour, 3 hour and 6 hours. Frequency of Xerostomia, Nausea and emesis was noted. Any rescue analgesia required was noted. **Results:** No clinical or statistical association with demographic parameters between the groups was observed. No statistical significance was found in post operative pain scores in both the groups. During postoperative follow - up intervals, paracetamol showed significantly lower VAS scores as compared to tramadol at baseline, 15 min, 30 min, 1 hour, 3 hour and 6 hours follow up intervals. 10 patients in tramadol group had nausea postoperatively (p>0.05). No side effect attributable to paracetamol was noticed. **Conclusion:** IV Paracetamol can be advocated as an efficacious, safer and pharmacoeconomic analgesic drug for post - operative pain relief in comparison to IV tramadol in Indian Population.*

Keywords: Post Operative Analgesia, Tramadol, Paracetamol, Laparoscopic Surgery

1. Introduction

Laparoscopic procedures aim for faster recovery & less postoperative analgesia as compared to other surgical procedures. Therefore, leading to early mobility and discharge. [1] Studies have shown that laparoscopic surgery can also lead to post - operative pain in at least 1/3 of patients thereby requiring analgesic for pain. [2]

Analgesia in laparoscopic procedures is required as there is stretching of peritoneum, residual gas in peritoneum and skin incisions during port insertion. [3] Adequate analgesia is one of the most important aspects for peri - operative period. Successful control of postoperative pain is critical as it also affect the final outcome of the surgery. [4, 5]

The International Association for the examination of Pain in 1986 defined analgesia as “an undesirable sensory and psychological experience related with actual or potential tissue harm or both.” [6]. A pain free post - operative period is required as it leads to early mobilization, decreased hospital stay, reduced stress feedback, sympathetic action and increment in patient comfort. [7]

Anaesthesiologists have a multimodality treatment approach to relieve pain. Local anaesthetics, NSAIDs, tricyclic anti - depressants, opioids, adjuvant drugs like anticonvulsants (Levetiracetam), ketamine and cyclo - oxygenase inhibitors. Opioids are commonly used to relieve post - operative pain. However, opioids have many adverse effects like respiratory depression, nausea, vomiting and addiction on long time uses. [8, 9] Attempts to use a safe drug with least adverse effects after day care surgery are increasing rapidly. [10]

Paracetamol is the utmost familiar specified analgesic for the treatment of acute pain. [11] It is used both intra - operatively and post - operatively through intravenous, oral, parenteral and rectal routes. Because of its efficacy, safety, absence of clinically significant side effect in comparison with other drugs, IV paracetamol is one of the important components of a multimodal analgesia for treating pain. [12]. Paracetamol has evident advantages over non - steroidal anti - inflammatory drugs in patients who have history of asthma or peptic ulcers and its least intervention in platelet action. [13]

Tramadol is proven to show better analgesic effect in both Intramuscular and Intravenous application for the management of postoperative pain. Tramadol belongs to the

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group of amino - cyclohexanol, a synthetic opioid and is centrally acting. [14] Tramadol is a safer drug to reduce the pain and doesn't cause significant depression of respiratory activity and sedation encountered with other opioids in postoperative pain treatment. [15] Tramadol can cause Central nervous system depression, seizures, increase in HR, cardiovascular and respiratory arrest. An increase in therapeutic doses of tramadol can lead to intoxication if it's being used for a long duration. [16]

This randomized single blind comparative study was planned to compare the efficacy of Tramadol IV and Paracetamol IV in post operative care after laparoscopic surgery. There is paucity of research for safety study on Paracetamol IV Vs Tramadol IV infusion. Both the drugs are being used in post operative care but restricted due to its side effects thus frequency of PONV was also compared.

2. Material and Method

All necessary approval and clearance for study was obtained from Institutional Ethical Committee of MMIMSR, Mullana. Informed written consent was obtained from all the patients. Present study was a prospective, single blinded randomized study performed in Department of Anaesthesiology, MMIMSR, Mullana, Ambala from 2019 - 2021. A total number of 100 adult patients of ASA (American society of Anaesthesiologist) grade I & II, age group between 20 - 60 years planned for elective laparoscopic procedures under general anaesthesia with controlled ventilation were included in our study. Exclusion criteria were hemodynamic instability; hepatic, respiratory and renal diseases; neuropathy; history of allergy to drugs; pregnant and lactating mothers. Patients who refused to give their consent were also excluded.

The patients were randomly divided into two groups. Group P (n=50): Comprised of patients who received intravenous Paracetamol (20mg /kg in 100 ml solution) and group T (n=30): Comprised of patients who received intravenous Tramadol (2 mg/kg in 100 ml NS). A pre anaesthetic assessment was done one day previous to the surgery with all the required routine investigations. Every patient given ranitidine 150mg and alprazolam 0.25mg one day prior to the surgery and patient will be kept nil per oral.

Prior to the surgery, patients were explained about the VAS 0 to 10 of pain, and the pain management scores. In the operating room all routine vitals like peripheral oxygen saturation, heart rate, ECG, diastolic BP, MABP and systolic BP, were checked. Fluid therapy was started with after securing intra - cath.

Later 3 minutes of pre oxygenation, anaesthesia was induced with propofol (2 milligram/kg), fentanyl 1.5µg/kg, (50: 50) N₂O: O₂ and vecuronium (0.1mg/kg iv). Endotracheal intubation with appropriate size endotracheal tube and controlled ventilation was carried out. After securing the endotracheal tube anaesthesia was maintained with N₂O: O₂, isoflurane and vecuronium. Fifteen minute before extubation the patient was given the drug according to the group allocated. Initial dose of analgesic (either Tramadol 2mg/kg IV or Paracetamol 20mg/kg IV) was given to the patients in

intraoperatively period during skin suturing. Neostigmine (0.04 mg/kg) and glycopyrrolate (0.01mg/kg) were given at the end of the procedure to reverse neuromuscular blockage.

The parameter recording includes post operative pain score, diastolic blood pressure (mmHg), systolic blood pressure (mmHg), main arterial blood pressure (mmHg), heart rate (b/min) and oxygen saturation post - operatively. Pain was measured based on the visual analogue scale. VAS was obtained at jut baseline (T0) and in post operatively at 15 min (T1), 30 min (T2), 1 hr (T3), 3 hr (T4), 6 hr (T5).

Statistical analysis

Post hoc power analysis was carried out utilizing the software package, G*Power (Faul and Erdfelder 1992). The alpha level utilize for this analysis was $p < 0.05$ and beta was 0.20. Sample size was assessed from the outcome of past study utilizing the T1 visual analogue score as the variable, which was the primary outcome of our study. Along an outcome size of 0.65 with 10% possibility of inaccuracy with $\alpha = 0.05$, $\beta = 0.20$ and trust interval of 95%, our sample size be announced to be 50 subjects each group at power of 90.

3. Results

The present observational study was carried out on 100 patients between age group 20 to 60 year. Both the groups included 50 patients. Mean age of the patients in group T & group P was 41 ± 1.0 . No significant difference was observed in age and weight of both the groups. There were 46% male and 54% female in Tramadol Group and 44% male and 56% female in the Paracetamol Group. (Table 1). Both the groups were comparable.

72% of patient of group T were ASA 1 whereas for group P 58% patient were ASA 1. 28% of patient of group T were ASA 2 while for group P 42% patient were ASA 2. The mean weight of patient with group T was 56.16 kg whereas for group P 58.00 kg. Tramadol group had 32% Patients in mallampati grade 1 and 68% patients in mallampati grade 2. Paracetamol group had 16% Patients in mallampati grade 1 and 84% patients in mallampati grade 2. Hence no significant difference was observed between 2 groups.

Table 2 Shows the comparison of VAS at the different time interval in Tramadol group and Paracetamol group. Mean VAS at baseline was 0.54 in Group T and mean visual analogue score was 0.16 in group P. There was significant variation between 2 groups (p - value 0.019). Mean visual analogue score at 15 min was 0.34 in Group T and mean visual analogue score was 0.04 in group P. There was significant variation between 2 groups (p - value 0.002). Mean visual analogue score in Group T at 3 hours was 0.30 ± 0.51 and in group P at 3 hours was 0.00 ± 0.00 . There was significant variation between 2 groups (p - value 0.013). However, mean visual analogue score in group T was at 6hr was 1.10 and mean visual analogue score in group P was 0.78. There was significant variable between 2 groups (p - value 0.041)

Table 3 Shows the comparison of heart rate at the different time interval in Tramadol group and Paracetamol group. Mean heart rate at baseline was 83.46 ± 11.89 in group T and

81.86±11.73 in group P at baseline. There was no significant variable. Mean heart rate was 88.42±11.91 at 15 min in tramadol group and 83.38±11.80 in paracetamol group. There was significant variable between 2 groups (p - value 0.017). Mean heart rate was 85.52±11.91 in Group T at 30 min and 81.90±10.46 in group P. There was no significant variable in between the group. Mean heart rate at 3 hr was 85.66±10.84 in Group T and 79.54±8.27 in group P. There was significant variable between 2 groups (p - value 0.007) At 6 hr mean heart rate was 83.46±7.07 in Group T and 79.46±8.24 in group P. There was significant variable between 2 groups (p - value 0.017)

Table 4 Displays the differentiation of SBP at different time interval in tramadol and paracetamol group. At baseline mean systolic blood pressure was 119.12±11.77 mmHg in tramadol group while 114.92±11.07 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05). At 15 min mean systolic blood pressure was 123.60±9.76 mmHg in tramadol group while 115.82±9.75 mmHg in paracetamol group. It was significant difference (p value >0.000). At 30 min mean systolic blood pressure was 116.04±10.41 mmHg in tramadol group while 115.68±9.62 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05). At 1 hr mean systolic blood pressure was 115.98±8.29 mmHg in tramadol group while 115.60±10.20 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05). At 3 hr mean systolic blood pressure was 118.34±7.85 mmHg in tramadol group while 114.72±9.47 mmHg in paracetamol group. It was significant difference (p value >0.008). At 6 hr mean systolic blood pressure was 118.18±8.20 mmHg in tramadol group while 113.60±10.34 mmHg in paracetamol group. It was significant variable (p value >0.002).

Table 5 Shows the comparison of diastolic blood pressure at different time interval in tramadol and paracetamol group. At baseline mean diastolic blood pressure was 77.38±9.10 mmHg in tramadol group while 75.46±9.05 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05). At 15 min mean diastolic blood pressure was 80.26±8.19 mmHg in tramadol group while 75.28±9.05 mmHg in paracetamol group. It was significant difference (p value >0.001).

At 30 min mean diastolic blood pressure was 76.20±7.13 mmHg in tramadol group while 74.30±7.48 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05).

At 1 hr mean diastolic blood pressure was 75.74±8.58 mmHg in tramadol group while 75.46±6.74 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05).

At 3 hr mean diastolic blood pressure was 78.18±6.02 mmHg in tramadol group while 73.40±7.88 mmHg in paracetamol group. It was significant difference (p value >0.000).

At 6 hr mean diastolic blood pressure was 78.56±6.60 mmHg in tramadol group while 74.66±8.25 mmHg in paracetamol group. It was significant variable (p value >0.002).

Table 6 Shows the comparison of Mean Arterial Pressure at different time interval in tramadol and paracetamol group. At baseline mean Arterial Pressure was 91.29±9.21 mmHg in tramadol group while 88.61±9.04 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05).

At 15 min mean Arterial Pressure was 94.71±7.67 mmHg in tramadol group while 88.79±8.58 mmHg in paracetamol group. It was significant difference (p value >0.000).

At 30 min mean Arterial Pressure was 89.48±7.17 mmHg in tramadol group while 88.09±7.42 mmHg in paracetamol group. It was no difference between 2 groups significant (p value >0.05).

At 1 hr mean Arterial Pressure was 89.15±6.19 mmHg in tramadol group while 88.84±5.47 mmHg in paracetamol group. It was no significant difference between 2 groups (p value >0.05).

At 3 hr mean Arterial Pressure was 91.57±5.83 mmHg in tramadol group while 87.17±7.49 mmHg in paracetamol group. It was significant difference (p value >0.000).

At 6 hr mean Arterial Pressure was 91.77±6.31 mmHg in tramadol group while 87.64±8.09 mmHg in paracetamol group. It was significant (p value >0.001).

Table 7 Displays the variation of SPO₂ at different time interval in tramadol and paracetamol group. At baseline mean SPO₂ was 99.88±0.33 in tramadol group while 99.76±0.48 in paracetamol group. It was no significant variation between 2 groups (p value >0.05).

At 15 min mean saturation of peripheral oxygen was 99.86±0.40 in group T while 99.70±0.61 in group P. It was no significant variation between 2 groups (p value >0.05).

At 30 min mean saturation of peripheral oxygen was 99.90±0.42 in group T while 99.84±0.89 in group P. It was no significant variation between 2 groups (p value >0.05).

At 1 hr mean saturation of peripheral oxygen was 99.82±0.75 in group T while 99.88±0.85 in group P. It was no significant variation between 2 groups (p value >0.05).

At 3 hr mean saturation of peripheral oxygen was 99.92±0.27 in group T while 99.92±0.34 in group P. It was no significant variation between 2 groups (p value >0.05).

At 6 hr mean saturation of peripheral oxygen was 99.98±0.14 in T - group while 100.00±0.00 in group P. It was no significant variation between 2 groups (p value >0.05).

Table 8 There were 10 subjects who showed nausea and vomiting in Group T and only 0 subject undergoing laparoscopic surgery showed nausea and vomiting in Group P. There was significant variation in between tramadol and paracetamol groups (p=0.001).

Table 9 There were 8% patients undergoing laparoscopic surgery who experienced dry mouth in Tramadol group and

4% patients undergoing laparoscopic surgery that showed dry mouth in Group P. There were non-significant variations in between both groups.

4. Discussion

Postoperative pain control is one of the most important and an ever-challenging role for an anaesthesiologist team. Postoperative pain is alterable in period, severity and nature. It is the main holding factor for discharge of patients undergoing day-care (routine) surgical procedures which involve laparoscopy thereby adding to the hospital price. Pain after laparoscopic surgery may vary act to site. The pathophysiology is complex, it could be due to destruction to abdominal wall structures, inflammation, visceral trauma [17, 18] or peritoneal discomfort because of CO₂ entrapment under the hemi-diaphragms [19]. Generally, non-steroid anti-inflammatory drugs and opioids are given for post-operative pain treatment, but due to their disputed results they are losing their value as post-analgesic drugs. Paracetamol, a non-opioid has developed to be potent, with slow to rapid recovery in patients undergoing laparoscopic cholecystectomy¹¹ while tramadol which has agonist activity at μ -opioid receptors also acquired momentum owing to his central analgesic effect and weak opioid agonistic character¹⁴. In the present study, the efficacy of tramadol hydrochloride and paracetamol infusion for post-operative pain relief in patients undergoing laparoscopic surgery under general anaesthesia. Heart rate has been as well as Blood pressure estimated in both groups were comparable. Post-surgical stress response caused increase in haemodynamic parameters. Post Operative stress response is reduced in laparoscopic surgeries, however post operative pain with surgical stress causes increase in hemodynamic response in early phase. [20]

M. Ali et al. (2009) compared tramadol alone with a combination of paracetamol and tramadol for day care laparoscopic procedures. In a research all of sixty patients of age group between eighteen to forty year were take on in the research. Patient were separated into 2 equal groups, group 1 received tramadol alone (1.5 mg/kg (-1) and group 2nd received combination of intravenous tramadol (1 mg/kg (-1) and 1g oral paracetamol. In results they found that the highest pain VAS score was recorded at 30 minutes postoperatively and the incidence of nausea and vomiting was more in group 1 (tramadol alone). They concluded that

paracetamol 1gm oral along with tramadol to 1mg per kg reduced side effects incidence of tramadol along with maintaining the same analgesic efficacy. [21]

As there is lake of literature concerning IV paracetamol infusion, we decided to take on the present study comparing IV tramadol and IV paracetamol. In our study we compared IV tramadol 2 mg/kg slow I. V repeated after 8 hour and IV paracetamol infusion 1000 milligram in 100 ml, administered within 15 min, repeated six hourly. We have utilized paracetamol IV infusion of 1000 mg in 100 ml normal saline solution as analgesic dose as was utilized by Bandey S et al. [10] The dose of tramadol IV infusion of 2 milligram /kg as an analgesic was utilized by Gunes Y et al. [22] Other research concluded by Shahid M et al. compared IV paracetamol 1000mg in 100 ml vial infused over 15 min prior 30 min completion of procedure versus Intravenous tramadol 2 mg/kg slow prior 30 min completion of procedure. [23] The present study was a comparative study done in 100 patients between age group 20 to 60 years at Maharishi Markandeshwar institute of medical sciences and research, Mullana. To study the efficacy of tramadol hydrochloride and paracetamol infusion for post-operative pain relief in patients undergoing laparoscopic surgery.

In our study mean age in group PCM was 42.92±9.00 & in group Tramadol was 41.78±9.00, hence both group was comparable to each other Suhail bandey et al [30] conducted a study in which mean age group with group p was 43.17±9.13 & group T was 42.90±10.45 and Mehet Ziya Yilmaz et al [24] conducted a study in which mean age group with group p was 48.1±14.1 & group T was 43.8±9.8.

In our study for group P we had 28 females & 22 males whereas for group T we took 27 female & 23 males. Hence both the groups were comparable in each other. In our study VAS score at T0 with group P was 3.78±0.93 & group T WAS 3.94±0.74. Which was comparable with Suhail Bandey et al. [30] with VAS score at T1 with group P was 3.16±0.37 was 3.16±0.37 was comparable with Suhail Bandey et al (Table 10). In our study nausea and vomiting was complained by 0 patient in group P & 10 in group T. Mehet Ziya Yilmaz et al [24] conducted a study is with 6 patients in group P & 8 patients in group T complained of nausea & vomiting. In our study dry mouth was complained by 2 patients in group P & 4 in group T.

Comparative study carried out similar to this study:

| Author name | Reference no. | Group compared | Outcome |
|-----------------------------------|---------------|---|---|
| Hoogewijs et al., (2000) | [25] | Compared intravenous Propacetamol, Pethidine, Tramadol and Diclofenac for pain in patients with peripheral injuries. | No difference between Propacetamol, Pethidine, Tramadol and Diclofenac was found in terms of pain control after single peripheral injuries. |
| Mustafa Arslan et al., (2013) | [26] | IV Paracetamol 1g/100 ml Vs 100 ml saline | IV Paracetamol 1g/100 ml was effective than compared to 100 ml saline |
| Khaled El-Radaideh et al., (2014) | [27] | Compared IV paracetamol plus Tramadol to Tramadol after desection of gallbladder | IV paracetamol and tramadol had prolong the time to first postoperative analgesic, less analgesic requirement and reduce VAS. |
| Mohammed Jawad et al., (2014) | [28] | Post Operative Pain Management with IV Tramadol and IV Paracetamol in Patients undergoing Laparoscopic cholecystectomy | Tramadol seemed more analgesic effect compared to Paracetamol in male patients, while Paracetamol seemed more effective in Female |
| Aftab Ahmad Khan et al., (2015) | [29] | Preemptive study of intravenous Paracetamol and intravenous Tramadol in patients undergoing laparoscopic cholecystectomy. | PCM had less VAS compared to Tramadol and significant lower total analgesic consumption. |

| | | | |
|-----------------------------|------|---|--|
| Rastogi B et al., (2016) | [30] | Preemptive Ketorolac and Paracetamol in cholecystectomy | Ketorolac was superior to Paracetamol |
| Suhail Bandey et al. (2016) | [31] | Intravenous PCM and Tramadol for postoperative pain management in laparoscopic cholecystectomy. | IV Paracetamol showed better results (Lower VAS) as compared to IV Tramadol. |
| Present Study | | IV Tramadol and IV Paracetamol for postoperative analgesia | IV paracetamol showed decrease visual analog score as compared to the IV Tramadol. |

Table 1: Patient Characteristics

| Variable | Tramadol (T) group (n=50) | Paracetamol (P) group (n=50) | p-value |
|----------------------|---------------------------|------------------------------|----------|
| Mean Age±SD (years) | 41.78±10.32 | 42.98±9.00 | p=0.537 |
| Mean Weight±SD (Kg) | 56.16±9.42 | 58.00±8.51 | p =0.264 |
| Male: Female | 23:27 | 22:28 | p =0.814 |
| ASA 1:2 | 36:14 | 29:21 | p =0.142 |
| MALLAMPATI GRADE 1:2 | 16:34 | 8:42 | p =0.061 |

Table 2: Comparison of mean VAS between two groups at different time intervals

| | Group T | | Group P | | Z | p-value |
|--------|---------|------|---------|------|--------|---------|
| | Mean | SD | Mean | SD | | |
| VAS_T0 | 3.94 | 0.74 | 3.78 | 0.93 | -1.421 | 0.155 |
| VAS_T1 | 3.54 | 0.86 | 3.16 | 0.37 | -2.340 | 0.019 |
| VAS_T2 | 3.34 | 0.63 | 3.24 | 0.43 | -0.448 | 0.654 |
| VAS_T3 | 3.36 | 0.63 | 3.24 | 0.43 | -0.667 | 0.504 |
| VAS_T4 | 2.30 | 0.51 | 2.00 | 0.00 | -4.011 | 0.000 |
| VAS_T5 | 2.36 | 0.60 | 2.12 | 0.39 | -2.478 | 0.013 |

Table 3: Comparison of mean Heart rate between two groups at different time intervals

| | Group T | | Group P | | Z | p-value |
|------------------------------|---------|-------|---------|-------|--------|---------|
| | Group T | SD | Group P | SD | | |
| Heart rate -T0 (at baseline) | 83.46 | 11.89 | 81.86 | 11.73 | -0.812 | 0.417 |
| Heart rate -T1 (at 15 min) | 88.42 | 11.91 | 83.38 | 11.80 | -2.384 | 0.017 |
| Heart rate -T2 (at 30 min) | 85.52 | 11.91 | 81.90 | 10.46 | -1.496 | 0.135 |
| Heart rate -T3 (at 1 hr.) | 84.38 | 12.61 | 80.74 | 9.62 | -1.181 | 0.238 |
| Heart rate -T4 (at 3 hr.) | 85.66 | 10.84 | 79.54 | 8.27 | -2.674 | 0.007 |
| Heart rate -T5 (at 6 hr.) | 83.46 | 7.07 | 79.46 | 8.24 | -2.377 | 0.017 |

Table 4: Comparison of mean SBP between two groups at different time intervals

| | Group T | | Group P | | Z | p-value |
|---|---------|-------|---------|-------|--------|---------|
| | Group T | SD | Group P | SD | | |
| Systolic Blood Pressure -T0 (at baseline) | 119.12 | 11.77 | 114.92 | 11.07 | -1.907 | 0.057 |
| Systolic Blood Pressure -T1 (at 15 min) | 123.60 | 9.76 | 115.82 | 9.75 | -4.017 | 0.000 |
| Systolic Blood Pressure -T2 (at 30 min) | 116.04 | 10.41 | 115.68 | 9.62 | -0.430 | 0.667 |
| Systolic Blood Pressure -T3 (at 1 hrs.) | 115.98 | 8.29 | 115.60 | 10.20 | -0.198 | 0.843 |
| Systolic Blood Pressure -T4 (at 3 hrs.) | 118.34 | 7.85 | 114.72 | 9.47 | -2.668 | 0.008 |
| Systolic Blood Pressure -T5 (at 6 hrs.) | 118.18 | 8.20 | 113.60 | 10.34 | -3.053 | 0.002 |

Table 5: Comparison of mean DBP between two groups at different time intervals

| | Group T | | Group P | | Z | p-value |
|--|---------|------|---------|------|--------|---------|
| | Group T | SD | Group P | SD | | |
| Diastolic Blood Pressure -T0 (at baseline) | 77.38 | 9.10 | 75.46 | 9.05 | -1.284 | 0.199 |
| Diastolic Blood Pressure -T1 (at 15 min) | 80.26 | 8.19 | 75.28 | 9.05 | -3.408 | 0.001 |
| Diastolic Blood Pressure -T2 (at 30 min) | 76.20 | 7.13 | 74.30 | 7.48 | -1.742 | 0.081 |
| Diastolic Blood Pressure -T3 (at 1 hrs.) | 75.74 | 8.58 | 75.46 | 6.74 | -0.035 | 0.972 |
| Diastolic Blood Pressure -T4 (at 3 hrs.) | 78.18 | 6.02 | 73.40 | 7.88 | -4.272 | 0.000 |
| Diastolic Blood Pressure -T5 (at 6 hrs.) | 78.56 | 6.60 | 74.66 | 8.25 | -3.045 | 0.002 |

Table 6: Comparison of mean MAP between two groups at different time intervals

| | Group T | | Group P | | Z | p-value |
|--|---------|------|---------|------|--------|---------|
| | Group T | SD | Group P | SD | | |
| Mean arterial pressure -T0 (at baseline) | 91.29 | 9.21 | 88.61 | 9.04 | -1.620 | 0.105 |
| Mean arterial pressure -T1 (at 15 min) | 94.71 | 7.67 | 88.79 | 8.58 | -4.003 | 0.000 |
| Mean arterial pressure -T2 (at 30 min) | 89.48 | 7.17 | 88.09 | 7.42 | -1.432 | 0.152 |
| Mean arterial pressure -T3 (at 1 hrs.) | 89.15 | 6.19 | 88.84 | 5.47 | -0.166 | 0.868 |
| Mean arterial pressure -T4 (at 3 hrs.) | 91.57 | 5.83 | 87.17 | 7.49 | -3.854 | 0.000 |
| Mean arterial pressure -T5 (at 6 hrs.) | 91.77 | 6.31 | 87.64 | 8.09 | -3.301 | 0.001 |

Table 7: Comparison of mean Saturation of peripheral oxygen between two groups at different time intervals

| | Group T | | Group P | | Z | p-value |
|--|---------|------|---------|------|--------|---------|
| | Mean | SD | Mean | SD | | |
| Saturation of peripheral oxygen-T0 (at baseline) | 99.88 | 0.33 | 99.76 | 0.48 | -1.355 | 0.175 |
| Saturation of peripheral oxygen -T1 (at 15 min) | 99.86 | 0.40 | 99.70 | 0.61 | -1.388 | 0.165 |
| Saturation of peripheral oxygen -T2 (at 30 min) | 99.90 | 0.42 | 99.84 | 0.89 | -0.420 | 0.675 |
| Saturation of peripheral oxygen -T3 (at 1 hrs.) | 99.82 | 0.75 | 99.88 | 0.85 | -0.985 | 0.325 |
| Saturation of peripheral oxygen -T4 (at 3 hrs.) | 99.92 | 0.27 | 99.92 | 0.34 | -0.359 | 0.720 |
| Saturation of peripheral oxygen -T5 (at 6 hrs.) | 99.98 | 0.14 | 100.00 | 0.00 | -1.000 | 0.317 |

Table 8: Percentage distribution of the patients according the Nausea & Vomiting

| Nausea and vomiting | Group T | | Group P | | Total | Chi-square value | p-value |
|---------------------|--------------|------------|--------------|------------|-------|------------------|---------|
| | No. of cases | Percentage | No. of cases | Percentage | | | |
| No | 40 | 80% | 50 | 100% | 90 | 11.111 | 0.001 |
| Yes | 10 | 20% | 0 | 0% | 10 | | |

Table 9: Percentage distribution of the patients according the Dry mouth

| Dry Mouth | Group T | | Group P | | Total | Chi-square value | p-value |
|-----------|--------------|------------|--------------|------------|-------|------------------|---------|
| | No. of cases | Percentage | No. of cases | Percentage | | | |
| No | 46 | 92% | 48 | 96% | 94 | 0.709 | 0.678 |
| Yes | 4 | 8% | 2 | 4% | 6 | | |

Table 10: Comparative study carried out similar to this study

| VAS | PRESENT STUDY | | Suhail Bandey et al. | |
|----------------------|---------------|-------------|----------------------|-------------|
| | TRAMADOL | PARACETAMOL | TRAMADOL | PARACETAMOL |
| T0 VAS (at baseline) | 3.94±0.74 | 3.78±0.93 | 3.47±0.51 | 3.10±0.61 |
| T1 VAS (at 15 min) | 3.16±0.37 | 3.16±0.37 | 3.03±0.93 | 2.53±0.63 |
| T2 VAS (at 30 min) | 3.34±0.63 | 3.24±0.43 | 3.23±0.77 | 3.03±0.67 |
| T3 VAS (at 1 hrs) | 3.36±0.63 | 3.24±0.43 | 4.20±0.66 | 3.53±0.68 |
| T4 VAS (at 3 hrs) | 2.30±0.51 | 2.00±0.00 | 3.97±0.93 | 3.43±0.63 |
| T5 VAS (at 6 hrs) | 2.36±0.60 | 2.12±0.39 | 3.03±1.03 | 2.93±0.83 |

5. Conclusion

According to the current study Tramadol and PCM both were comparable for post operative analgesia. IV paracetamol showed decrease visual analog score as compared to the IV Tramadol. Thus intravenous PCM infusion can be used effectively and safely in post operative patients undergoing laparoscopic surgery. The study needs to be carried out on a largest sample size to validate the above results. Paracetamol is also pharmacoeconomically better than compared to Tramadol.

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