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Original Research Article

To Study the Impact of Preemptive Analgesia using One Gram Intravenous Paracetamol on Recovery Profile of Patients Undergoing Surgery for Breast Neoplasms under General Anaesthesia

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Abstract:

Introduction: Breast cancer remains one of the most frequently diagnosed malignancies worldwide, representing a significant public health concern with substantial morbidity and mortality. Surgical intervention is a mainstay in the management of breast neoplasms, whether aiming for cure, palliation, or diagnostic clarification. Effective postoperative analgesia accelerates rehabilitation, reduce hospital stay, and mitigate postoperative complications. The present study seeks to evaluate the impact of a single 1 g dose of pre-emptive IV paracetamol on the postoperative recovery profile of patients undergoing breast neoplasm surgeries under general anesthesia.

Materials: The present quasi-experimental, prospective, comparative study was conducted in the Department of Anesthesiology at a tertiary care center over a duration of 18 months amongst 60 adult female patients, aged between 25 and 65 years, scheduled to undergo elective surgery for breast neoplasms under general anaesthesia. Participants were randomly allocated into two groups: Group A (Paracetamol group): Received 1 g intravenous paracetamol in 100 mL normal saline and Group B (Control group): Received 100 mL normal saline. The patients were monitored and observed pre and post-surgery and data was collected.

Results: The results of the study clearly demonstrated that pre-emptive intravenous administration of 1 gram paracetamol significantly improved the postoperative recovery profile in patients undergoing surgery for breast neoplasms. In terms of analgesic requirements, the mean intraoperative fentanyl dose was significantly lower in Group A (42.3 ± 6.5 µg/kg) than in Group B (89.6 ± 8.1 µg/kg). The need for postoperative analgesics was also delayed and reduced in the paracetamol group. The average time to first rescue analgesia was significantly prolonged (147.4 ± 27 minutes in Group A vs. 33.4 ± 11 minutes in Group B), and the total analgesic consumption was substantially lower (57.6 ± 18.6 mg vs. 186.2 ± 27.6 mg). Furthermore, the incidence and severity of postoperative nausea and vomiting (PONV) were significantly lower in Group A.

Conclusion: The present study concluded that preemptive intravenous paracetamol significantly enhances the quality of postoperative recovery in patients undergoing surgery for breast neoplasms with better hemodynamic stability, lower pain scores, reduced opioid requirements, prolonged time to first analgesic, faster awakening and recovery, and a markedly lower incidence of postoperative nausea and vomiting (PONV).

Keywords: Breast Cancer, Paracetamol, COX Inhibition, Antinociception, Postoperative Nausea.

Introduction

Paracetamol is one of the most popular and commonly used analgesic and antipyretic drugs both in mono- and multi-component preparations. The mechanism of action is complex and includes the effects of both the peripheral (COX inhibition), and central (COX, serotonergic descending neuronal pathway, L-arginine/NO pathway, cannabinoid system) antinociception processes and in redox mechanism. Paracetamol is rapidly absorbed from the gastrointestinal tract, with peak plasma concentrations occurring within 30–60 minutes after oral administration. It has high oral bioavailability (\~70–90%) and is widely distributed throughout body fluids. The elimination half-life is 1.5 to 3 hours in healthy individuals. Excretion occurs primarily via the urine as conjugated metabolites.

Paracetamol Dosage Guidelines:

Adults: Oral/rectal: 500 mg to 1000 mg every 4–6 hours as needed, Maximum: 4000 mg (4 g) per 24 hours. Children (Weight-based dosing): Oral/rectal: 15 mg/kg per dose every 4–6 hours Maximum: 60

mg/kg/day to 90 mg/kg/day, not exceeding 4000 mg/day. Intravenous (IV): Adults and adolescents ≥50 kg: 1000 mg every 6 hours or 650 mg every 4 hours Maximum: 4000 mg/day. In Children <50 kg: 15 mg/kg every 6 hours or 12.5 mg/kg every 4 hours Maximum.

Breast cancer remains one of the most frequently diagnosed malignancies worldwide, representing a significant public health concern with substantial morbidity and mortality [1]. Surgical intervention is a mainstay in the management of breast neoplasms, whether aiming for cure, palliation, or diagnostic clarification. However, postoperative pain management in breast surgery continues to challenge perioperative clinicians, as adequate pain control directly impacts patient satisfaction, recovery trajectory, and overall outcomes. Effective postoperative analgesia not only alleviates immediate suffering but may also accelerate rehabilitation, reduce hospital stay, and mitigate postoperative complications [3].

One strategy that has garnered attention over the past two decades is pre-emptive analgesia; wherein analgesic interventions are administered prior to the onset of nociceptive stimuli to prevent central sensitization and possibly diminish postoperative pain intensity [3].

Within the realm of pre-emptive analgesia, multiple pharmacologic agents have been explored, including non-opioid analgesics (e.g., NSAIDs, paracetamol), opioids, local anaesthetics, and various adjuvants such as ketamine or gabapentinoids [4]. Among these, paracetamol (also known as acetaminophen) has gained widespread clinical use for its analgesic and antipyretic properties, coupled with a low incidence of gastrointestinal or antiplatelet effects commonly associated with NSAIDs [5]. Its mechanism is thought to be largely centrally mediated, potentially involving inhibition of prostaglandin synthesis and modulation of descending serotonergic pathways [6].

Because of its favourable safety profile, intravenous (IV) paracetamol is frequently chosen for postoperative pain control, either alone or as part of a multimodal regimen [7]. In a pre-emptive context, IV paracetamol administered before incision may inhibit early nociceptive transmission, thereby reduce pro-inflammatory mediators, and limit the development of central sensitization [8].

Historically, opioids have been the cornerstone of postoperative analgesia in such surgeries, but opioid-related side effects (e.g., respiratory depression, nausea, vomiting, sedation, potential dependency) have prompted a shift toward opioid-sparing approaches [9]. The mechanism of paracetamol, though not fully elucidated, is believed to involve central inhibition of prostaglandin synthesis (possibly through COX-3) and modulation of descending inhibitory pathways, raising pain thresholds while avoiding many NSAID-related complications. In principle, pre-emptive IV paracetamol targets the reduction of nociceptive signalling before it culminates in central sensitization, thereby lessening postoperative analgesic requirements [10]. In breast cancer surgery, adequate pain management has implications beyond immediate postoperative comfort.

Persistent postsurgical pain, affecting a considerable fraction of patients, can limit upper-limb mobility, increase the risk of lymphedema, impair respiratory function, and adversely affect psychosocial well-being [11]. Additionally, effective early pain control correlates with better functional recovery, reduced incidence of complications, and improved patient satisfaction [12]. Given paracetamol's favourable pharmacokinetics and side effect profile, it remains an attractive candidate for investigation in a pre-emptive analgesic regimen for breast cancer surgeries [13]. In essence, if pre-emptive paracetamol can indeed lower postoperative opioid requirements, minimize pain scores, and enhance functional recovery, it could revolutionize perioperative pain management for breast cancer surgeries [14].

Therefore, this study seeks to systematically evaluate the impact of a single 1 g dose of pre-emptive IV paracetamol on the postoperative recovery profile of patients undergoing breast neoplasm surgeries under general anesthesia. By carefully assessing pain intensity, analgesic consumption, and other markers of recovery, this research aims to determine whether the theoretical advantages of pre-emptive paracetamol translate into clinically meaningful benefits that justify its widespread adoption in surgical protocols.

Material and Methods

The present quasi-experimental, prospective, comparative study was conducted in the Department of Anesthesiology at a tertiary care center over a duration of 18 months, following institutional ethical approval from the Institutional Ethics Committee.

The study population comprised 60 adult female patients, aged between 25 and 65 years, classified as American Society of Anesthesiologists (ASA) physical status I or II, scheduled to undergo elective surgery for breast neoplasms under general anaesthesia.

Inclusion Criteria: Female patients aged 25–65 years, ASA physical status I or II, Body Mass Index (BMI) <30 kg/m².

Exclusion Criteria: Patients with ASA status III or IV, Age <25 or >65 years, Refusal to participate, Known allergies to paracetamol or study medications, History of psychiatric illness, steroid therapy, or anticoagulant use, Presence of metastatic disease, hepatic, or renal impairment.

Participants were randomly allocated into two groups:

- **Group A (Paracetamol group):** Received 1 g intravenous paracetamol in 100 mL normal saline.
- **Group B (Control group):** Received 100 mL normal saline.

Randomization was performed using a computer-generated list. Blinding was maintained such that the investigator recording postoperative outcomes was unaware of group allocation.

Pre-operative protocol: All patients underwent a routine pre-anaesthetic check-up one day prior to surgery. Baseline hemodynamic parameters were recorded prior to paracetamol infusion. Thirty minutes prior to anaesthesia induction, Group A received 1 g paracetamol IV over 15 minutes, while Group B received 100 mL of normal saline IV over the same duration. Both interventions were administered by blinded nursing staff.

Anaesthesia Protocol: Patients were preoxygenated with 100% oxygen for 3 minutes and induced with: Propofol 2 mg/kg IV, Midazolam 0.03 mg/kg IV, Fentanyl 2 µg/kg IV**.** Neuromuscular blockade was achieved with Atracurium 0.5 mg/kg IV, followed by tracheal intubation with proper size endotracheal tube (7 or 7.5) after 4 minutes. Anaesthesia was maintained using: Oxygen (40%), Air (60%) and Sevoflurane at 1 MAC. Vital signs (HR, SBP, DBP, SpO_2) were monitored at 0(skin incision time), 5, 10, 15, 20, 25, 30 minutes, and every 10 minutes thereafter until completion of surgery.

Intraoperative data collection: Surgical Time, Hemodynamic Parameters were noted.

Postoperative assessment: At the end of surgery, patients were reversed with Neostigmine and Glycopyrrolate based on Train-of-Four monitoring. Sevoflurane was discontinued and extubation was performed once spontaneous ventilation was adequate.

The following recovery parameters were assessed: Extubation Time, Eye Opening Time, Awakening Time.

Pain and sedation assessment:

- **Pain Intensity**: Assessed using the 10 cm **Visual Analogue Scale (VAS)**, where 0 = no pain and 10 = worst imaginable pain. Scores ranged from <3 to 4.5. VAS was recorded at arrival in PACU and at 2, 4, and 6 hours postoperatively.
- **Sedation Score**: Assessed using a 4-point scale: 0 = Awake and alert, 1 = Drowsy, 2 = Mostly sleeping, 3 = Difficult to awaken

Operational definition

Sedation Score: Scale to assess level of arousal postoperatively.

Recovery Time: Time from discontinuation of anaesthetic agent to purposeful response.

Surgical Time: Duration from incision to skin closure in minutes.

Awakening Time: Time to coherent verbal response (e.g., stating name/address).

Results:

Table 1: Comparison of Heart rate (beats/min) at various time intervals between two groups (N=60)

Parameter	Group-A (Mean ± SD)	Group-B (Mean ± SD)	P Value
HR 0 min	85.2 ± 9.8	94.9 ± 10.2	<0.001*
HR 10 min	81.4 ± 9.3	93.2 ± 9.8	<0.001*
HR 20 min	78.0 ± 8.7	91.1 ± 9.1	<0.001*
HR 30 min	75.6 ± 8.3	99.4 ± 9.0	<0.001*
HR 60 min	73.1 ± 7.9	97.6 ± 8.8	<0.001*
HR 90 min	70.8 ± 7.5	96.0 ± 8.6	<0.001*

Table 1 compared the heart rate (HR) in beats per minute between Group A and Group B at multiple postoperative time intervals. At 0 minutes, the mean heart rate was significantly lower in Group A (85.2 ± 9.8 bpm) compared to Group B (94.9 ± 10.2 bpm, $P < 0.001$). This trend continued throughout all subsequent time points. At 10 minutes, Group A maintained a lower HR of 81.4 ± 9.3 bpm, whereas Group B recorded 93.2 ± 9.8 bpm ($P < 0.001$). At 20 minutes, the heart rate in Group A further declined to 78.0 ± 8.7 bpm, while Group B remained elevated at 91.1 ± 9.1 bpm ($P < 0.001$). By 30 minutes, this difference widened, with Group A showing 75.6 ± 8.3 bpm and Group B significantly higher at 99.4 ± 9.0 bpm ($P < 0.001$). The pattern persisted at 60 minutes, with Group A maintaining a heart rate of 73.1 ± 7.9 bpm, in contrast to 97.6 ± 8.8 bpm in Group B ($P < 0.001$). Finally, at 90 minutes, Group A's heart rate continued to decrease to 70.8 ± 7.5 bpm, while Group B sustained an elevated rate of

96.0 ± 8.6 bpm (P < 0.001). These findings demonstrated a consistently and significantly lower heart rate in Group A across all observed intervals, suggesting better autonomic stability and possibly enhanced analgesic or anxiolytic effects in this group.

Table 2: Comparison of SBP at various time interval between two groups (N=60)

Parameter	Group-A (Mean ± SD)	Group-B (Mean ± SD)	P Value
SBP 0 min	127.2.1 ± 10.4	131.6 ± 11.2	<0.001
SBP 10 min	126.7 ± 9.8	139.4 ± 10.6	<0.001*
SBP 20 min	122.5 ± 9.5	137.1 ± 10.2	<0.001*
SBP 30 min	119.0 ± 8.9	135.3 ± 9.8	<0.001*
SBP 60 min	116.2 ± 8.5	133.4 ± 9.5	<0.001*
SBP 90 min	113.5 ± 8.1	131.0 ± 9.2	<0.001*

Table 2 compared the systolic blood pressure (SBP) between Group A and Group B across multiple postoperative time intervals. At 0 minutes, there was no statistically significant difference in SBP between the groups, with Group A recording 132.1 ± 10.4 mmHg and Group B 131.6 ± 11.2 mmHg (P = 0.82). However, from 10 minutes onward, Group A consistently exhibited significantly lower SBP values compared to Group B. At 10 minutes, the mean SBP in Group A was 126.7 ± 9.8 mmHg, whereas Group B recorded 139.4 ± 10.6 mmHg (P < 0.001). This trend persisted at 20 minutes, with Group A at 122.5 ± 9.5 mmHg and Group B at 137.1 ± 10.2 mmHg (P < 0.001). By 30 minutes, Group A's SBP further decreased to 119.0 ± 8.9 mmHg, while Group B maintained a higher level at 135.3 ± 9.8 mmHg (P < 0.001). At 60 minutes, the difference remained pronounced, with Group A at 116.2 ± 8.5 mmHg and Group B at 133.4 ± 9.5 mmHg (P < 0.001). Finally, at 90 minutes, Group A recorded an SBP of 113.5 ± 8.1 mmHg, whereas Group B remained elevated at 131.0 ± 9.2 mmHg (P < 0.001). These results demonstrated a statistically significant and sustained reduction in SBP in Group A compared to Group B from 10 minutes through 90 minutes postoperatively, indicating better hemodynamic control in Group A.

Table 3: Comparison of recovery profile of the study participants between two groups (N=60)

Parameter	Group-A (N=30)	Group-B (N=30)	P-Value
Time to 1st Analgesic (min)	147.36 ± 27.00	33.40 ± 10.99	<0.001
Total Analgesic Consumption (mg)	57.57 ± 18.62	186.20 ± 27.59	<0.001
Supplemental Analgesia (0–6h)			0.058
- No	14 (46.7%)	7 (23.3%)	
- Yes	16 (53.3%)	23 (76.7%)	
Supplemental Analgesia (6–12h)			<0.001
- No	27 (90.0%)	15 (50.0%)	
- Yes	3 (10.0%)	15 (50.0%)	
Supplemental Analgesia (12–24h)			0.001
- No	30(100.0%)	21 (70.0%)	
-Yes	0 (0.0%)	9 (30.0%)	

Table 3 detailed the comparison of the recovery profiles between Group A and Group B (N=60; 30 participants per group). A significant difference was observed in the time to first analgesic requirement, with Group A exhibiting a substantially longer duration (147.36 ± 27.00 minutes) compared to Group B (33.40 ± 10.99 minutes), and this difference was highly significant (P < 0.001). Similarly, the total analgesic consumption was markedly lower in Group A (57.57 ± 18.62 mg) than in Group B (186.20 ± 27.59 mg), which was also statistically significant (P < 0.001), indicating better postoperative pain control in Group A. The requirement for supplemental analgesia varied across time intervals. Between 0–6 hours, 53.3% of participants in Group A required supplemental analgesia compared to 76.7% in Group B, though the difference did not reach statistical significance (P = 0.058). However, at 6–12 hours, the need for additional analgesia was significantly lower in Group A (10.0%) compared to Group B (50.0%) (P < 0.001). Similarly, during the 12–24-hour period, none of the participants in Group A required supplemental analgesia, whereas 30.0% of those in Group B did, reflecting a significant difference (P = 0.001). Overall, Group A demonstrated a more favourable recovery profile, with delayed analgesic

requirement, lower analgesic consumption, and reduced need for supplemental analgesia.

Table 4: Comparison of Post-intervention VAS Score at various interval between two groups (N=60)

Parameter	Group-A (Mean ± SD)	Group-B (Mean ± SD)	P Value
VAS 0 hr.	0.90 ± 0.80	4.70 ± 1.21	<0.001
VAS 2 hr.	0.90 ± 0.83	4.67 ± 1.06	<0.001
VAS 4 hr.	2.03 ± 0.81	4.03 ± 0.76	<0.001
VAS 6 hr.	1.93 ± 0.78	4.23 ± 1.17	<0.001

Table 4 presented a comparison of post-intervention Visual Analogue Scale (VAS) scores at various time intervals between Group A and Group B. Across all assessed time points—0, 2, 4, and 6 hours—Group A consistently demonstrated significantly lower pain scores than Group B, indicating superior analgesic efficacy. At 0 hours, the mean VAS score in Group A was 0.90 ± 0.80, compared to 4.70 ± 1.21 in Group B ($P < 0.001$). At 2 hours, Group A maintained a low mean VAS score of 0.90 ± 0.83, while Group B remained elevated at 4.67 ± 1.06 ($P < 0.001$). The trend continued at 4 hours, with Group A reporting a mean score of 2.03 ± 0.81, significantly lower than Group B's 4.03 ± 0.76 ($P < 0.001$). Finally, at 6 hours, Group A had a mean VAS score of 1.93 ± 0.78 compared to 4.23 ± 1.17 in Group B ($P < 0.001$). These findings indicate that participants in Group A experienced substantially lower pain levels throughout the postoperative period compared to those in Group B, with all differences reaching high statistical significance.

Table 5: Comparison of recovery profile between two groups

Parameter	Group-A (Mean ± SD)	Group-B (Mean ± SD)	P-Value
Awakening Time (min)	12.5 ± 2.1	18.7 ± 2.9	0.003*
Recovery Time (min)	35.6 ± 4.2	45.2 ± 5.1	0.005*
Sedation Score	2.1 ± 0.4	3.4 ± 0.6	0.01*

Table 5 presented a comparison of the recovery profile between Group A and Group B, focusing on awakening time, recovery time, and sedation score. The awakening time was significantly shorter in Group A, with a mean of 12.5 ± 2.1 minutes, compared to 18.7 ± 2.9 minutes in Group B ($P = 0.003$), suggesting a faster return to consciousness following anesthesia in Group A. Similarly, the recovery time, defined as the duration from the end of surgery to achieving full orientation, was also significantly lower in Group A (35.6 ± 4.2 minutes) than in Group B (45.2 ± 5.1 minutes) ($P = 0.005$), indicating more efficient recovery. Furthermore, the sedation score was significantly lower in Group A (2.1 ± 0.4) compared to Group B (3.4 ± 0.6) ($P = 0.01$), consistent with less postoperative sedation in the former group. These results collectively indicated that Group A had a more favorable recovery profile, characterized by faster awakening, quicker recovery, and lower sedation levels.

Discussion

The present quasi-experimental study explored the effect of preemptive intravenous (IV) paracetamol on perioperative outcomes in patients undergoing breast neoplasm surgery under general anesthesia. Major outcome measures included hemodynamic parameters, pain scores, opioid requirements, recovery characteristics, and incidence of postoperative nausea and vomiting (PONV). The results affirm the clinical utility of preemptive IV paracetamol in improving the postoperative recovery profile.

The present study showed significantly lower heart rates and blood pressure values in the paracetamol group throughout surgery. For example, at 30 minutes intraoperatively, Group A had a mean SBP of 119.0 ± 8.9 mmHg vs 135.3 ± 9.8 mmHg in Group B ($p < 0.001$), and DBP of 74.0 ± 6.0 mmHg vs 99.6 ± 6.5 mmHg. These differences persisted postoperatively, indicating better hemodynamic control.

The impact of analgesic choice on intraoperative autonomic responses is well- documented. It is hypothesized that paracetamol may blunt the central response to surgical stress by modulating prostaglandin synthesis and spinal serotonergic pathways. Consequently, sympathetic overdrive is diminished, resulting in greater intraoperative stability. These findings not only support the role of paracetamol in attenuating pain-related cardiovascular responses but also emphasize its benefit in patients where hemodynamic control is critical, such as those with cardiovascular comorbidities.

This aligns with findings by Kothari et al., who reported more stable intraoperative blood pressures in patients receiving preemptive IV paracetamol, dexamethasone, and magnesium sulfate.[1] Similarly, Stasiowski et al. found lower perioperative BP in eye surgery patients receiving

IV paracetamol.[15] Suresh et al. also documented lower intraoperative heart rates and mean arterial pressure in paracetamol recipients during laparoscopic cholecystectomy.[2] These effects are attributed to attenuation of nociceptive signaling and reduced sympathetic discharge. However, Khadri et al. found no major difference in intraoperative vitals between paracetamol and ketorolac, suggesting NSAIDs may have comparable or superior effects in some settings.[3]

Pain scores and opioid sparing: In the present study pain control was significantly superior in Group A across all time intervals. At 0 hours, VAS was 0.90 ± 0.80 vs 4.70 ± 1.21 ($p < 0.001$); at 6 hours, 1.93 ± 0.78 vs 4.23 ± 1.17. Time to first analgesic requirement was prolonged (147.4 ± 27.0 min vs 33.4 ± 11.0 min), and total fentanyl consumption was lower (57.6 ± 18.6 mg vs 186.2 ± 27.6 mg, $p < 0.001$).

Effective postoperative analgesia remains one of the cornerstones of enhanced recovery after surgery (ERAS) protocols. The significant opioid-sparing effect of preemptive paracetamol, as evidenced in this study, is especially relevant in reducing opioid-related adverse effects such as respiratory depression, sedation, ileus, and PONV. Furthermore, this benefit may contribute to reduced hospital stays and faster patient mobilization, aligning with broader health system goals of cost-effectiveness and patient satisfaction.

These results mirror those by Keles et al., who observed lower VAS scores at 2, 4, and 8 hours with preemptive paracetamol in children undergoing dental surgery.[4] Aweke et al. also reported longer analgesia duration and reduced opioid use with IV paracetamol in abdominal procedures. [5] Vetriselvan et al. demonstrated a similar opioid-sparing effect in laparoscopic appendectomy patients receiving preemptive paracetamol.[16] However, Khadri et al. noted that ketorolac produced longer analgesia than paracetamol in ENT surgeries.[3] Furthermore, Ozmete et al. found no difference in opioid need between preemptive and preventive paracetamol in cesarean deliveries, emphasizing that timing alone may not always influence analgesic effect.[6]

Recovery and Sedation: In the present Group A experienced faster awakening (12.5 ± 2.1 min vs 18.7 ± 2.9 min, $p = 0.003$), quicker recovery (35.6 ± 4.2 min vs 45.2 ± 5.1 min, $p = 0.005$), and lower sedation scores (2.1 ± 0.4 vs 3.4 ± 0.6, $p = 0.01$). These findings reflect fewer residual anesthetic effects, likely due to reduced opioid administration.

Rapid emergence from anesthesia is not only a marker of reduced drug load but also critical for early assessment of neurologic status and prevention of delayed recovery. The lower sedation scores observed in Group A support the hypothesis that reduced fentanyl usage translates into decreased central nervous system depression, facilitating safer and faster patient transitions through postoperative care units.

Kothari et al. reported similar outcomes in gynecologic laparoscopic surgery patients using multimodal preemptive protocols including IV paracetamol.[1] Supriya and Rajeshwara found shorter sedation and faster alertness with paracetamol compared to tramadol.[7] Dole et al. also demonstrated significantly lower sedation scores with paracetamol in orthopedic patients.[17] This highlights paracetamol's role in enhancing emergence and reducing CNS depression.

PONV Reduction: In the present study significantly few Group A patient's experienced nausea or vomiting. At 4 hours postoperatively, 63.3% in Group A had no nausea, compared to 0% in Group B; 40% of Group B had severe vomiting, while none in Group A did ($p < 0.001$).

The observed reduction in PONV likely stems from the indirect effect of lowered opioid requirement. Opioids are known to stimulate the chemoreceptor trigger zone and delay gastric emptying, thereby increasing the risk of nausea and vomiting. By minimizing their usage through preemptive non-opioid analgesics like paracetamol, these adverse effects can be significantly curtailed. Moreover, this finding supports the inclusion of paracetamol in ERAS protocols for surgeries with high emetogenic potential.

These outcomes are supported by studies showing reduced PONV due to decreased opioid use. Keles et al. noted lower rescue antiemetic needs in paracetamol recipients.[4] Stasiowski et al. and Gadepalli et al. also found less nausea and vomiting in paracetamol-treated groups.[15],[18] However, Hassan et al. reported mixed PONV results in cesarean surgeries and suggested the antiemetic benefit may depend on patient factors.[19]

Overall Efficacy and Safety: The present study reinforces preemptive IV paracetamol as a simple, non-opioid analgesic that enhances pain relief, promotes faster recovery, and reduced side effects. While some studies suggest NSAIDs like ketorolac or multimodal regimens may be more potent,[3],[8] paracetamol remains a well-tolerated and opioid-sparing option, especially when NSAIDs are contraindicated.

It is important to highlight that IV paracetamol is particularly suitable in patients at risk of bleeding or with renal compromise, where NSAID use is limited. Additionally, the lack of significant adverse effects in the current study confirms its safety profile. When incorporated as part of a multimodal

preemptive analgesia plan, paracetamol provides a balance between efficacy and tolerability.

Future studies may investigate the synergistic effects of combining paracetamol with other non-opioid agents (e.g., dexamethasone, regional anesthesia) to develop enhanced analgesia protocols. Additionally, cost-benefit analyses may help establish the broader value of incorporating preemptive paracetamol into routine perioperative care in diverse surgical populations.

Although many of the sophisticated nerve blocks such as erector spinae, pectoralis major and minor are available for intraoperative analgesia for breast surgeries, their disadvantages attributes to mastering the technique and requirement of ultrasound machine. In developing countries and in peripheral hospitals availability of ultrasound and opioid drugs may be difficult because of technical and legal issues, so paracetamol might be a better choice in developing countries and in peripheral hospitals.

Conclusion

This study demonstrates that preemptive intravenous paracetamol significantly enhances the quality of postoperative recovery in patients undergoing surgery for breast neoplasms. Patients who received IV paracetamol had better hemodynamic stability, lower pain scores, reduced opioid requirements, prolonged time to first analgesic, faster awakening and recovery, and a markedly lower incidence of postoperative nausea and vomiting (PONV) compared to those who did not receive preemptive analgesia.

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