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ORIGINAL RESEARCH

Serratus Posterior Superior Intercostal Plane Block and Serratus Anterior Plane Block Compared with Conventional Analgesia for Postoperative Analgesia in Breast Cancer Surgery: A Randomized Controlled Trial

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Video Abstract

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Purpose: The aim of this study was to compare the analgesic efficacy and recovery outcomes of the serratus posterior superior intercostal plane block (SPSIPB) and the serratus anterior plane block (SAPB) with conventional analgesia in patients undergoing oncoplastic breast surgery.

Patients and Methods: One hundred and five patients aged 18–65 years with an ASA physical status of I–III were included in this prospective, randomized controlled study. Patients were randomly assigned in a 1:1:1 ratio to three groups: the Control Group, the SPSIPB Group, and the SAPB Group. Outcome assessors were blinded to group allocation. The primary outcome was cumulative tramadol consumption during the first 24 h postoperative. Secondary outcomes included Numeric Rating Scale (NRS) scores at rest and during activity, Quality of Recovery-15 (QoR-15) scores, and the incidence of postoperative nausea and vomiting (PONV).

Results: Cumulative tramadol consumption during the first 24 h was significantly lower in the SPSIPB and SAPB groups compared with the Control Group ($p < 0.001$), with no significant difference between the two block groups. Although NRS pain scores were comparable among groups at all time points, QoR-15 scores were significantly higher and antiemetic requirements were lower in both block groups compared with the Control Group.

Conclusion: The SPSIPB and SAPB reduced opioid consumption and improved quality of recovery compared with conventional management, despite similar pain scores, with no significant difference between the two techniques.

Keywords: breast surgery, postoperative pain management, opioid consumption, regional anesthesia

Introduction

Breast cancer is the most frequently diagnosed malignancy among women worldwide and remains a major public health concern. Surgical intervention constitutes the cornerstone of treatment; however, postoperative pain following breast surgery is a significant source of morbidity and may adversely affect recovery and quality of life.[1,2] Inadequate management of acute postoperative pain has been associated with the development of chronic pain, prolonged hospital stays, and an increased surgical stress response. Although opioid-based analgesic regimens are effective in controlling pain, their dose-dependent adverse effects—such as nausea, vomiting, and sedation—may negatively impact post-operative recovery. Therefore, current perioperative guidelines emphasize multimodal analgesia strategies, incorporating regional anesthesia techniques to minimize opioid consumption and associated complications.[3]

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Oncoplastic breast surgery combines oncological resection with reconstructive techniques, resulting in a more extensive surgical field and potentially increased nociceptive input compared with conventional breast procedures.[4] Consequently, effective analgesic strategies are particularly important in this patient population. Among regional anesthesia techniques, interfascial plane blocks have gained increasing attention due to their relative ease of application and favorable safety profile.

The serratus posterior superior intercostal plane block (SPSIPB) is a relatively recently described interfascial technique used for analgesia in thoracic wall and breast surgery. Performed via a posterior approach medial to the scapula, this technique may allow extensive craniocaudal spread of local anesthetic, potentially affecting both the lateral cutaneous branches of the intercostal nerves and the dorsal rami.[5] In contrast, the serratus anterior plane block (SAPB), applied to the anterolateral chest wall, is a well-established technique with proven efficacy in breast surgery.[6,7] While SAPB primarily targets the lateral cutaneous branches along the anterolateral thoracic wall, SPSIPB may provide broader posterior and segmental coverage, which could translate into differences in dermatomal distribution and analgesic profile.

Despite growing interest in these techniques, current evidence remains limited by a lack of direct head-to-head comparisons between SPSIPB and SAPB, as well as heterogeneity in study designs and outcome measures across studies. Furthermore, many studies have focused primarily on pain scores without adequately addressing opioid consumption as an objective measure of analgesic efficacy. In this context, cumulative opioid consumption within the first 24 hours represents a clinically meaningful and objective endpoint that reflects both pain intensity and analgesic requirements.[8]

Therefore, this study aimed to compare opioid consumption, pain scores, and quality of recovery during the first 24 hours in patients undergoing oncoplastic breast surgery receiving either SAPB or SPSIPB, in comparison with conventional analgesia.

Materials and Methods

Study Design

This prospective, randomized controlled trial was conducted at Zonguldak Bülent Ecevit University Hospital between May 2025 and December 2025, following approval from the Local Ethics Committee (Protocol No: 2025/01-12). The study was carried out in accordance with the principles of the Declaration of Helsinki and was registered in the ClinicalTrials.gov database prior to patient enrollment (NCT06948383). Written and verbal informed consent were obtained from all participants. In the preoperative period, all patients received detailed instructions regarding the Numeric Rating Scale (NRS), the Quality of Recovery-15 (QoR-15) questionnaire, and the use of the patient-controlled analgesia (PCA) device. The QoR-15 is a previously published, validated patient-reported outcome measure; a Turkish linguistic validation study has demonstrated its reliability and applicability in Turkish patients.[9] The study was conducted in adherence to the Consolidated Standards of Reporting Trials guidelines.

Study Population

Patients aged 18–65 years with an ASA physical status I–III scheduled for unilateral oncoplastic breast surgery (mastectomy with sentinel lymph node biopsy) were included in the study. Exclusion criteria included refusal to participate, known allergy or hypersensitivity to the study drugs, coagulopathy, infection at the block injection site, chronic analgesic use, body mass index (BMI) >35 kg/m^2, inability to cooperate, and planned bilateral surgery.

Randomization and Blinding

Group allocation was performed by an independent researcher not involved in the study using a computer-based randomization program (www.randomizer.org). Patients were randomly assigned in a 1:1:1 ratio to one of three groups: the Control Group (conventional analgesia management without block intervention), the SPSIPB Group, or the SAPB Group. Allocation concealment was ensured using sealed, opaque, sequentially numbered envelopes prepared by the researcher responsible for randomization and opened on the day of surgery. Due to the nature of the interventions, the anesthesiologists performing the block procedures were not blinded. However, surgeons, ward nurses, postoperative data collectors, and the researchers performing the statistical analysis were blinded to group allocation.

Interventions

All blocks were performed preoperatively in the block room under aseptic conditions. To minimize inter-operator variability and ensure standardization, all blocks were administered by the same anesthesiologists, each of whom had previously performed the relevant techniques at least 50 times. Patients were transferred to the operating room 20 min after block completion.

Serratus Posterior Superior Intercostal Plane Block

Following standard monitoring, patients were placed in the prone position, and 1 mg of intravenous (IV) midazolam was administered for procedural comfort. A linear ultrasound probe (3–13 MHz, MyLab X7; Esaote, Genoa, Italy) was positioned in the sagittal plane at the level of the 2nd and 3rd ribs on the surgical side, along the medial border of the scapula. The trapezius, rhomboid major, and serratus posterior superior (SPS) muscles, as well as the 2nd and 3rd ribs, were visualized. After identifying the relevant anatomical structures, a 22 G, 50 mm peripheral block needle was advanced in a craniocaudal direction using the in-plane technique toward the interfascial plane between the 3rd rib and the SPS muscle. Following negative aspiration, hydrodissection with 2 mL of saline was performed to confirm needle tip position. Subsequently, 30 mL of 0.25% bupivacaine was injected into the plane (Figure 1).

Serratus Anterior Plane Block

Following standard monitoring, patients were placed in the supine position, and the arm on the surgical side was abducted 90°. For sedation, 1 mg of IV midazolam was administered. A linear ultrasound probe (3–13 MHz, MyLab X7; Esaote, Genoa, Italy) was positioned in the sagittal plane at the level of the 5th rib along the midaxillary line. The latissimus dorsi, serratus anterior, and intercostal muscles, as well as the 5th rib, were visualized. A 22 G, 50 mm block needle was advanced using the in-plane technique, and the needle tip was directed toward the interfascial plane between the serratus anterior muscle and the 5th rib. Following negative aspiration, hydrodissection with 2 mL of saline was performed to confirm needle tip position. Subsequently, 30 mL of 0.25% bupivacaine was injected into the plane (Figure 2).

Anesthesia Management

In addition to standard monitoring, bispectral index (BIS) monitoring was utilized for all patients, and a standardized general anesthesia protocol was followed. Anesthesia induction was achieved with 1 mg/kg lidocaine, 2–3 mg/kg propofol, 1 mcg/kg fentanyl, and 0.6 mg/kg rocuronium. Following endotracheal intubation and confirmation of tube

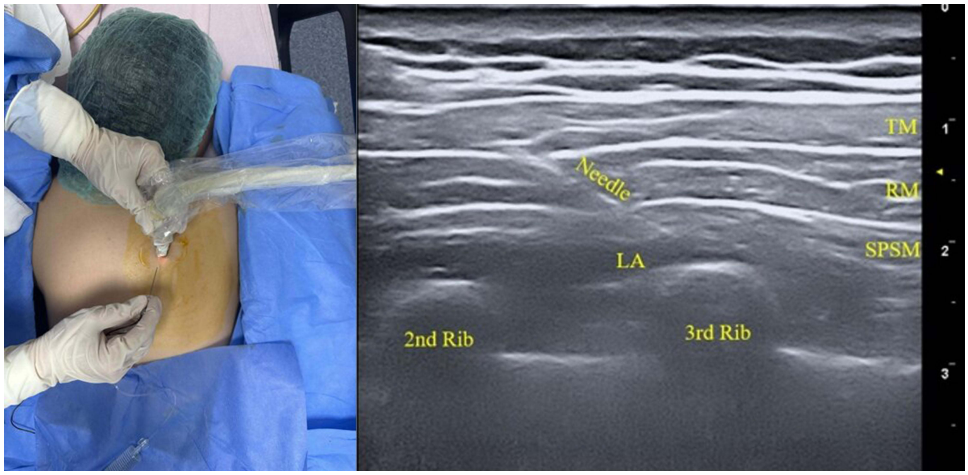

Figure 1 Ultrasound image of SPSIPB application.
Abbreviations: TM, Trapezius Muscle; RM, Rhomboid Major Muscle; SPSM, Serratus Posterior Superior Muscle; LA, Local Anesthetic.

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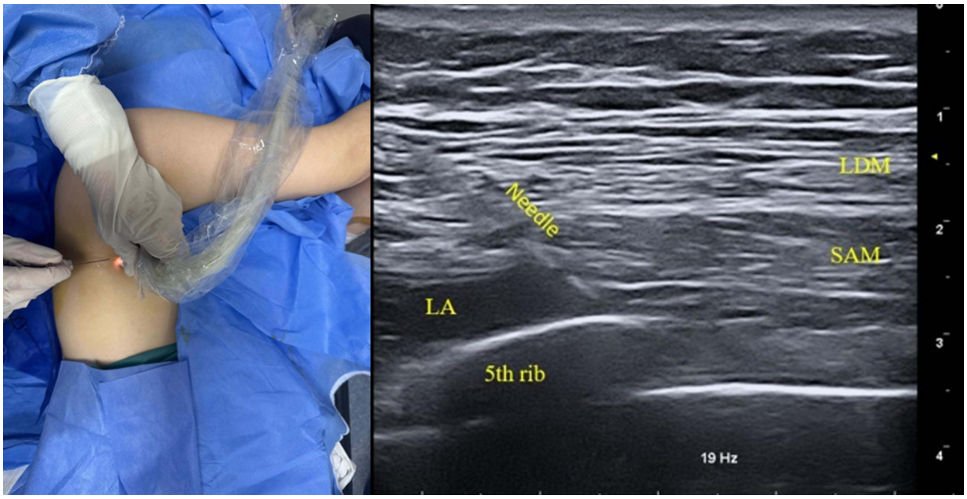

Figure 2 Ultrasound image of SAPB application.
Abbreviations: LDM, Latissimus Dorsi Muscle; SAM, Serratus Anterior Muscle; LA, Local Anesthetic.

placement, patients were connected to a mechanical ventilator. Mechanical ventilation parameters were set to a tidal volume of 6–8 mL/kg, PEEP of 5 cmH_2O, and a 50% air–oxygen mixture. Respiratory rate was adjusted to maintain end-tidal carbon dioxide between 35 and 45 mmHg.

Anesthesia maintenance was provided with 1–2% sevoflurane inhalation to maintain a BIS value between 40 and 60. Remifentanil infusion was titrated between 0.05 and 0.2 mcg/kg/min to maintain mean arterial pressure and heart rate within ±20% of baseline values. All surgical procedures were performed by the same surgeon using a standardized surgical technique. Hemodynamic data were recorded at regular intervals.

Approximately 30 min before the anticipated end of surgery, 1 g paracetamol, 10 mg metoclopramide, and 1 mg/kg tramadol were administered intravenously. Upon completion of skin closure (final suture), the remifentanil infusion was discontinued, and total remifentanil consumption was recorded. In this study, the time from induction to extubation was defined as "anesthesia duration"; the time from skin incision to the final suture as "surgical duration"; and the time from the final suture to extubation as "emergence time." For antagonism of neuromuscular blockade, 2–4 mg/kg IV sugammadex was used, and patients were transferred to the recovery unit following extubation.

Postoperative Pain Management

Upon admission to the recovery unit, patients were monitored according to standard protocols and connected to a PCA device. The PCA device was programmed to deliver tramadol with no basal infusion, a 10 mg bolus (2 mL), and a 20-min lockout interval. The time of admission to the recovery unit was defined as "Hour 0." Pain scores were assessed using the NRS at rest and dynamically (during coughing). Patients with an NRS score ≥4 received 25 mcg of IV fentanyl as rescue analgesia. If the NRS score remained ≥4 after 15 min, the fentanyl dose was repeated. The total consumption of rescue analgesics in the recovery unit was recorded. Patients with a Modified Aldrete Score ≥9 were transferred to the ward.

During ward follow-up, all patients received 1 g of IV paracetamol every 8 h. Resting and dynamic NRS scores were assessed at 1, 2, 6, 12, and 24 h postoperative. Despite the standard analgesia protocol (PCA and paracetamol), if the NRS score was ≥4, 0.25 mg/kg of IV pethidine was administered as rescue analgesia. The PCA was discontinued at 24 h postoperative. Cumulative tramadol consumption (at 6, 12, and 24 h), total rescue analgesic consumption, QoR-15 questionnaire scores at 24 h postoperative, and all complications occurring throughout the process were recorded.

Postoperative Nausea and Vomiting (PONV)

The presence of PONV was assessed at 0, 1, 2, 6, 12, and 24 h following extubation using the Verbal Rating Scale (VRS). The scale was graded as follows: 0 = no nausea; 1 = mild nausea; 2 = severe nausea; and 3 = vomiting. During assessment, patients with a VRS score ≥2 received 4 mg of IV ondansetron; if required, the dose was repeated at 8 h intervals. Scores at all measurement time points and total antiemetic consumption were recorded.

Outcomes

The primary outcome of the study was cumulative opioid (tramadol) consumption during the first 24 h postoperative. Secondary outcomes included resting and dynamic (during coughing) NRS scores at 0, 1, 2, 6, 12, and 24 h postoperative; the incidence of PONV; QoR-15 scores at 24 h postoperative; and complications related to the block techniques or opioid use.

Statistical Analysis

Sample size was calculated using G*Power software based on data from a pilot study of 12 patients not included in the main study. Based on the primary endpoint, "24-h cumulative tramadol consumption" (Control Group: 65.83 ± 30.88 mg; SPSIPB Group: 43.33 ± 28.71 mg; SAPB Group: 48.33 ± 25.16 mg; effect size f = 0.340), a minimum of 29 patients per group was required to achieve 80% power at a 95% confidence interval. To ensure sufficient power for secondary endpoints, a second analysis was performed based on 24-h postoperative QoR-15 scores (Control Group: 130.83 ± 20.41; SPSIPB Group: 143.08 ± 6.80; SAPB Group: 133.67 ± 18.63; effect size f = 0.319), which indicated a minimum of 33 patients per group was required with the same confidence interval and power. Accounting for potential dropout, the sample size was set at 37 patients per group (total 111 patients).

Statistical analysis was performed using IBM SPSS Statistics for Windows, Version 29.0 (IBM Corp., Armonk, NY, USA). Descriptive data are presented as mean ± standard deviation (95% confidence interval) and median (interquartile range) for quantitative variables, and as frequency and percentage for qualitative variables. The normality of quantitative data within groups was assessed using the Shapiro–Wilk test. One-way analysis of variance (ANOVA) was used to compare normally distributed continuous variables among the three groups; where significant differences were detected, multiple comparisons were performed using the Tukey post hoc test. The Kruskal–Wallis test was used to compare non-normally distributed variables among groups. When a significant difference was observed, Dunn–Bonferroni-corrected post hoc tests were applied for pairwise comparisons. The chi-square test was used to compare categorical data. In all analyses, the confidence interval was set at 95%, and statistical significance was defined as $p < 0.05$.

Results

A total of 111 patients were assessed for eligibility during the study period. Six patients were excluded (4 declined to participate, 2 due to chronic opioid use). The remaining 105 randomized patients were allocated to three groups: the Control Group (n=35), the SPSIPB Group (n=35), and the SAPB Group (n=35). No patients were lost to follow-up, and data from 105 patients were included in the statistical analysis (Figure 3). There were no statistically significant differences between the groups regarding age, BMI, ASA physical status, anesthesia duration, surgical duration, or emergence time ($p > 0.05$). Demographic and operative data are presented in Table 1.

Intraoperative remifentanil consumption was significantly lower in both block groups (SPSIPB and SAPB) compared with the Control Group ($p < 0.001$). No significant difference was observed between the two block groups regarding remifentanil consumption ($p = 0.509$). Cumulative tramadol consumption at 6, 12, and 24 h postoperative was significantly lower in the SPSIPB and SAPB groups than in the Control Group at all time points ($p < 0.001$). There was no statistically significant difference between the SPSIPB and SAPB groups regarding tramadol consumption ($p = 1.000$). Intraoperative remifentanil consumption and postoperative cumulative tramadol consumption are summarized in Table 2.

The QoR-15 scores evaluated at 24 h postoperative were significantly higher in the SPSIPB Group (median: 144) and SAPB Group (median: 140) compared with the Control Group (median: 135) ($p < 0.001$ and $p = 0.039$, respectively). No significant difference was found between the two block groups regarding QoR-15 scores ($p = 0.283$).

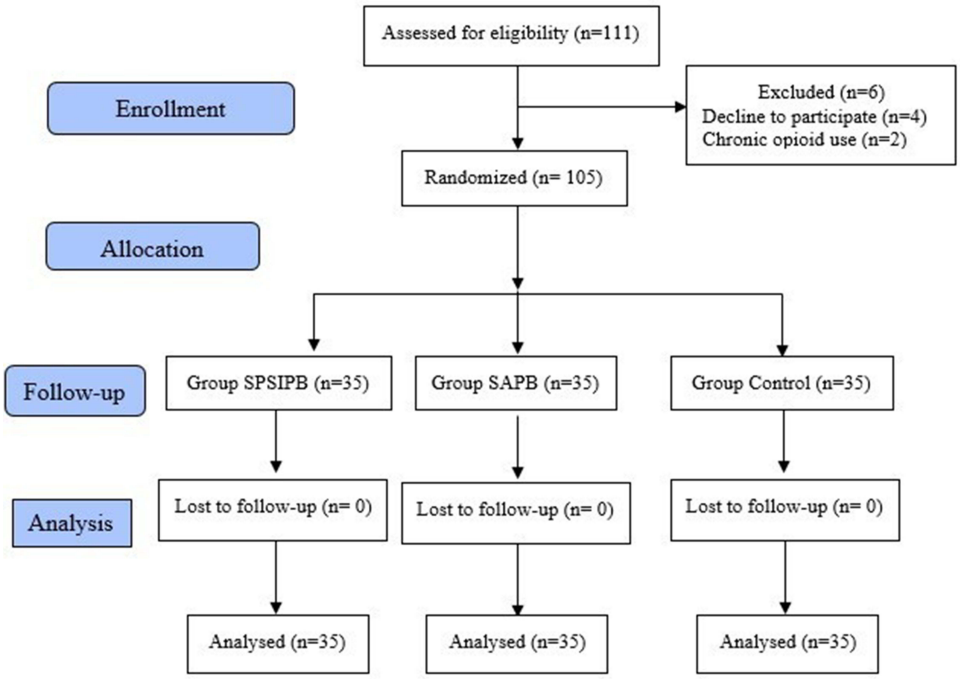

Figure 3 CONSORT flow diagram.

Postoperative resting and dynamic NRS pain scores are shown in Table 3. At all measurement time points (0, 1, 2, 6, 12, and 24 h), no statistically significant differences were found between groups in resting or dynamic NRS scores ($p > 0.05$). No rescue analgesia (fentanyl and pethidine) was required for any patient during follow-up in the post-anesthesia care unit (PACU) and ward. There were no statistically significant differences between groups in PONV scores ($p > 0.05$) (Table 4). However, the proportion of patients requiring antiemetic drugs in the postoperative period was significantly lower in the SPSIPB Group (11.4%) and SAPB Group (17.1%) compared with the Control Group (40%) ($p = 0.011$). No complications related to the block intervention (pneumothorax, hematoma, respiratory depression) were recorded during the study.

Table 1 Demographic Characteristics and Operative Data of the Patients

	Group SPSIPB (n=35)	Group SAPB (n=35)	Group Control (n=35)	p
Age (years)	54.29 ± 9.63	55.31 ± 7.92	53.80 ± 8.81	0.316
BMI (kg/m^2)	28.83 ± 4.84	28.88 ± 4.45	29.80 ± 4.64	0.532
ASA PS (II/III), n (%)	25 (71.4) / 10 (28.6)	30 (85.7) / 5 (14.3)	27 (77.1) / 8 (22.9)	0.347
Anesthesia time (min)	107.31 ± 39.48	107.71 ± 39.66	119.66 ± 49.64	0.564
Surgery time (min)	80.94 ± 36.76	81.37 ± 36.28	91.03 ± 47.39	0.861
Emergence time (s)	360.0 ± 178.8	354.8 ± 201.3	396.0 ± 236.5	0.828

Note: Data are presented as mean ± standard deviation or number (%).
Abbreviations: ASA PS, American Society of Anesthesiologists Physical Status; BMI, Body Mass Index; SPSIPB, Serratus Posterior Superior Intercostal Plane Block; SAPB, Serratus Anterior Plane Block; min, minute; s, second.

Table 2 Intraoperative and Postoperative Opioid Consumption, Antiemetic Use, and QoR-15 Scores

	Group SPSIPB (n=35)	Group SAPB (n=35)	Group Control (n=35)	p	p*		
					SPSIPB vs SAPB	SPSIPB vs Control	SAPB vs Control
Intraoperative remifentanil consumption (mcg)	168.5±112.3	217.7±152.7	334.2±218.2	**<0.001**	0.509	**<0.001**	**0.038**
Tramadol consumption, first 6 h (mg)	22.0±19.6 (15.2–28.7)	27.7±25.7 (18.8–36.5)	61.4±27.8 (51.8–71.0)	**<0.001**	1	**<0.001**	**<0.001**
Tramadol consumption, first 12 h (mg)	29.4±25.5 (20.6–38.2)	42.2±37.5 (29.3–55.1)	81.4±37.8 (68.4–94.4)	**<0.001**	0.544	**<0.001**	**<0.001**
Tramadol consumption, first 24 h (mg)	40.0±29.9 (29.7–50.2)	50.2±42.4 (35.7–64.8)	116.0±46.7 (99.9–132.0)	**<0.001**	1	**<0.001**	**<0.001**
Patients used antiemetic drugs, n(%)	4 (11.4)	6 (17.1)	14 (40)	**0.011**	0.367	**0.006**	**0.031**
Total QoR-15 scores	144 (140–149)	140 (133–148)	135 (131–140)	**<0.001**	0.283	**<0.001**	**0.039**

Notes: Data are presented as mean ± standard deviation (95% confidence interval), median (interquartile range [25th–75th percentiles]), or number (%).p* indicates statistical significance in post-hoc pairwise comparisons. Bold values indicate statistically significant differences ($p < 0.05$).

Abbreviations: SPSIPB, Serratus Posterior Superior Intercostal Plane Block; SAPB, Serratus Anterior Plane Block; QoR-15, Quality of Recovery-15; CI, Confidence Interval; h, hour; mg, milligram; mcg, microgram.

Table 3 Comparison of Postoperative Resting and Dynamic Numerical Rating Scale (NRS) Scores

	NRS_R/NRS_D	Group SPSIPB (n=35)	Group SAPB (n=35)	Group Control (n=35)	P
0^{th}	NRS_R	1 (1–2)	1 (1–2)	2 (1–2)	0.249
	NRS_D	2 (1–3)	2 (2–3)	3 (2–3)	0.147
1^{st}	NRS_R	1 (1–1)	1 (1–2)	1 (1–2)	0.391
	NRS_D	2 (1.75–2)	2 (1–3)	2 (2–3)	0.755
2^{nd}	NRS_R	1 (0–1)	1 (0–1)	1 (0–1)	0.683
	NRS_D	2 (1–2)	2 (1–2)	2 (1–2)	0.443
6^{th}	NRS_R	0 (0–1)	1 (0–1)	0 (0–1)	0.306
	NRS_D	1 (1–2)	2 (1–2)	2 (1–2)	0.671
12^{th}	NRS_R	0 (0–1)	0 (0–1)	0 (0–1)	0.807
	NRS_D	1 (1–1)	1 (1–2)	1 (1–2)	0.499
24^{th}	NRS_R	0 (0–0)	0 (0–0)	0 (0–0)	0.132
	NRS_D	1 (0–1)	1 (1–1)	1 (1–1)	0.121

Note: Data are presented as median (interquartile range [25th–75th percentiles]).

Abbreviations: NRS, Numerical Rating Scale; NRSR, Resting NRS; NRSD, Dynamic NRS; SPSIPB, Serratus Posterior Superior Intercostal Plane Block; SAPB, Serratus Anterior Plane Block.

Table 4 Postoperative Nausea and Vomiting (PONV) Scores

PONV Score	Group SPSIPB (n=35)	Group SAPB (n=35)	Group Control (n=35)	p
0 h	0 (0–0)	0 (0–0)	0 (0–0)	0.750
1 h	0 (0–0)	0 (0–0)	0 (0–1)	0.246
2 h	0 (0–0)	0 (0–1)	0 (0–1)	0.057
6 h	0 (0–1)	0 (0–1)	1 (0–1)	0.097
12 h	0 (0–1)	0 (0–1)	1 (0–1)	0.282
24 h	0 (0–1)	1 (0–1)	1 (0–1)	0.236

Note: Data are presented as median (interquartile range [25th–75th percentiles]).

Abbreviations: PONV, Postoperative Nausea and Vomiting; SPSIPB, Serratus Posterior Superior Intercostal Plane Block; SAPB, Serratus Anterior Plane Block; h, hour.

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Discussion

In this randomized controlled trial involving patients undergoing unilateral oncoplastic mastectomy with sentinel lymph node biopsy, both the SPSIPB and SAPB were associated with reduced opioid requirements compared with conventional analgesia. Intraoperative remifentanil consumption was lower in both block groups, and cumulative postoperative tramadol consumption during the first 24 h (including at 6 and 12 h) was consistently reduced. Importantly, resting and dynamic NRS pain scores were comparable among the groups at all assessed time points. At 24 h postoperative, QoR-15 scores were higher in both block groups than in the Control Group, with no difference between the SPSIPB and SAPB groups, indicating superior early postoperative recovery.

The SPSIPB is a relatively newly described interfascial plane block that has garnered increasing interest for thoracic wall surgery. Cadaveric studies and radiological evaluations suggest that local anesthetic administered in this plane may exhibit extensive craniocaudal spread, potentially affecting the dorsal rami at certain segments in addition to the lateral cutaneous branches of the intercostal nerves.[5] Studies have also reported the efficacy of the SPSIPB for postoperative analgesia in breast surgery.[10,11] In contrast, the SAPB is a widely used technique in clinical practice, and its efficacy for postoperative pain management in breast surgery is supported by multiple studies.[12] However, to the best of our knowledge, no randomized controlled trial has directly compared the SPSIPB and SAPB in terms of analgesic efficacy and quality of recovery in patients undergoing oncoplastic breast surgery. Therefore, our study aims to address this gap in the literature by comparing these two plane blocks within the same surgical population.

In their study evaluating the effect of the SPSIPB in oncoplastic breast surgery, Köksal et al[11] reported that the block reduced postoperative opioid requirements and could be effectively used as a component of multimodal analgesia. Similarly, Arık et al[13] compared the SPSIPB with the erector spinae plane (ESP) block in breast surgery, finding that the SPSIPB decreased opioid consumption and potentially provided a longer duration of analgesia than the ESP block. Regarding the SAPB, a Cochrane network meta-analysis indicated that it provides early postoperative pain control comparable to that of the paravertebral block.[14] Consistent with these reports, our finding that both the SPSIPB and SAPB reduced opioid requirements compared with conventional analgesia, while maintaining similar pain scores, suggests that adequate analgesia can be achieved with reduced opioid consumption and that both techniques offer comparable analgesic efficacy.

While statistical significance confirms the efficacy of an intervention, clinical relevance is the cornerstone of patient-centered outcomes. A recent scoping review by Saito et al[8] (2025) established the minimal important difference (MID) for rescue opioid consumption in acute pain as 5 mg IV morphine equivalents (MEQ). In the present study, the reduction in cumulative 24-h tramadol consumption in the SPSIPB and SAPB groups compared with the Control Group corresponded to approximately 7.6 mg and 6.6 mg IV MEQ, respectively. These observed reductions exceed the provisional 5 mg threshold proposed by Saito et al[8] indicating that both fascial plane blocks provide not only statistically significant but also clinically meaningful analgesia compared with conventional management.

Although the SAPB and SPSIPB demonstrated comparable analgesic efficacy and opioid-sparing effects in our study, procedural feasibility, particularly regarding patient positioning, may influence technique selection in routine practice. The SAPB can be readily performed in the supine position and incorporated into the standard workflow for breast surgery without requiring posterior exposure. In contrast, the SPSIPB is typically performed with the patient in the lateral decubitus or sitting position to facilitate access to the scapular region; consequently, it may require repositioning or a less convenient setup depending on the timing of the block.[15] As highlighted in ergonomics-focused discussions of peripheral nerve blocks, positioning and equipment setup should prioritize operator ergonomics while maintaining patient stability and safety.[16] If the SPSIPB is performed after induction, turning an intubated patient introduces logistical complexity and potential risks related to airway and line security and hemodynamic changes, in addition to increasing staff workload.[17] Therefore, given equivalent analgesic outcomes, the SAPB may offer a practical advantage for patients requiring supine positioning or in settings where repositioning is undesirable. Conversely, the SPSIPB remains a useful alternative when lateral chest-wall anatomy is altered (due to prior surgery, radiotherapy, or infection) or when the incision extends beyond the mid-axillary line, rendering a posterior approach preferable.

While postoperative pain scores are frequently used to assess efficacy in regional anesthesia studies, intraoperative opioid consumption may serve as a more objective and pragmatic surrogate measure of antinociceptive efficacy against surgical stimuli. Oncoplastic breast surgery imposes a substantial nociceptive burden involving procedural stages such as skin incision, glandular dissection, and tissue retraction. Both the SPSIPB and SAPB have been shown to reduce intraoperative opioid consumption in breast surgery.[11,18] In our study, despite maintaining anesthetic depth within a BIS range of 40–60 and titrating remifentanil infusion to hemodynamic targets, the higher remifentanil requirement observed in the Control Group suggests that the intraoperative analgesic demand of this surgery is considerable. Conversely, the lower intraoperative remifentanil requirement in patients receiving the SPSIPB or SAPB supports the notion that both blocks contribute meaningfully to intraoperative antinociception and demonstrate "analgesic efficiency" through opioid sparing. From this perspective, these plane blocks function as effective regional antinociceptive components that limit opioid consumption within a balanced anesthesia strategy, extending their utility beyond postoperative analgesia alone.

A notable finding of our study is that the relationship between pain scores and patient comfort or quality of recovery may not always correlate. Although low and comparable NRS values were observed among all three groups, the lower QoR-15 scores in the Control Group compared with the block groups suggest that pain control alone may be insufficient to explain the early postoperative recovery experience. Indeed, the QoR-15 encompasses multiple domains beyond pain, including nausea and vomiting, overall well-being, physical independence, and emotional state. In this context, the observation that the Control Group required higher opioid consumption—and consequently greater antiemetic use—to achieve low pain scores suggests that increased opioid exposure may have adversely affected the 24-h recovery experience through gastrointestinal side effects. Conversely, the reduced opioid consumption and antiemetic requirements in patients receiving the SPSIPB or SAPB may have contributed to a postoperative course that was not only "pain-free" but also characterized by a lower burden of adverse effects. Therefore, the clinical benefit of these plane blocks should be interpreted not merely based on NRS scores, but rather as providing "analgesic efficiency" that enhances patient-centered recovery outcomes by mitigating opioid-related side effects.

Regarding safety, no major block-related complications—such as puncture site hematoma, infection, persistent motor block, or local anesthetic systemic toxicity—were observed in either group. Thoracic blocks carry a known, albeit rare, risk of pneumothorax.[19] In our study, all blocks were performed under ultrasound guidance, allowing for real-time visualization of the needle tip and local anesthetic spread. While these findings suggest that ultrasound-guided thoracic plane blocks have an acceptable safety profile in this population, meticulous technique and close monitoring remain essential given the potential for rare but serious complications.

This study has several limitations. First, sensory block levels and effectiveness were not systematically confirmed using a standardized method prior to surgical incision. In addition, the absence of objective confirmation of block success (eg, sensory mapping) may limit the ability to precisely correlate block performance with analgesic outcomes. Second, because block performance time, dermatomal coverage, and hospital length of stay were not systematically assessed, inferences regarding real-world feasibility, clinical workload, and resource utilization are limited. In addition, limiting follow-up to the first 24 h postoperative precluded evaluation of the long-term effects of the blocks on chronic postoperative pain (at 1, 3, and 6 months). Similarly, the lack of QoR-15 assessment over longer follow-up periods limits conclusions regarding the intervention's impact on sustained patient-centered outcomes.

Conclusion

This study demonstrated that both the serratus posterior superior intercostal plane block and serratus anterior plane block improved postoperative analgesic management compared with conventional analgesia in patients undergoing oncoplastic breast surgery. Both techniques significantly reduced opioid consumption and improved quality of recovery, while pain scores were comparable across all groups. No significant difference was observed between the two block techniques. However, these findings are limited to the first 24 hours postoperative period and do not reflect longer-term outcomes.

Data Sharing Statement

Data is provided within the manuscript.

Ethics Approval and Consent to Participate

The study was performed in accordance with the declaration of Helsinki. Ethical approval from the Ethics Committee of the Zonguldak Bülent Ecevit University was obtained prior to initiation of the study (Protokol no: 2025/01-12). The patients were provided with a detailed explanation of the preoperative procedure, and verbal and written informed consent was obtained.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare no competing interests in this work.

References

1. Elmas Ö, Karadeniz Çakmak G, Bakkal BH. A comparison between modified radical mastectomy and breast-conserving surgery concerning the quality of life in patients with breast cancer under 50 years of age. *Med J West Black Sea*. 2021;5(1):63–67.
2. Łukasiewicz S, Czeczelewski M, Forma A, et al. Breast cancer-epidemiology, risk factors, classification, prognostic markers, and current treatment strategies-an updated review. *Cancers*. 2021;13(17):4287. doi:10.3390/cancers13174287
3. Afonso AM, Newman MI, Seeley N, et al. Multimodal analgesia in breast surgical procedures: technical and pharmacological considerations for liposomal bupivacaine use. *Plast Reconstr Surg Glob Open*. 2017;5(9):e1480. doi:10.1097/GOX.0000000000001480
4. Clough KB, Kaufman GJ, Nos C, et al. Improving breast cancer surgery: a classification and quadrant per quadrant atlas for oncoplastic surgery. *Ann Surg Oncol*. 2010;17(5):1375–1391. doi:10.1245/s10434-009-0792-y
5. Tulgar S, Ciftci B, Ahiskalioglu A, et al. Serratus posterior superior intercostal plane block: a technical report on the description of a novel periparavertebral block for thoracic pain. *Cureus*. 2023;15(2):e34582. doi:10.7759/cureus.34582
6. But M, Wernicki K, Zieliński J, et al. A comparison of the effectiveness of the serratus anterior plane block and erector spinae plane block to that of the paravertebral block in the surgical treatment of breast cancer-a randomized, prospective, single-blinded study. *J Clin Med*. 2024;13(16):4836. doi:10.3390/jcm13164836
7. Chai B, Wang Q, Du J, et al. Research progress on serratus anterior plane block in breast surgery: a narrative review. *Pain Ther*. 2023;12 (2):323–337. doi:10.1007/s40122-022-00456-z
8. Saito A, Laigaard J, Bjersand Sunde P, et al. Minimal important difference for rescue opioid consumption in adults with acute pain: a scoping review. *Eur J Pain*. 2025;29(10):e70151. doi:10.1002/ejp.70151
9. Kara U, Şimşek F, Kamburoğlu H, et al. Linguistic validation of a widely used recovery score: quality of recovery-15 (QoR-15). *Turk J Med Sci*. 2022;52(2):427–435. doi:10.55730/1300-0144.5330
10. Kültüroğlu G, Altınsoy S, Özgüner Y, et al. Novel serratus posterior superior intercostal plane block provided satisfactory analgesia after breast cancer surgery: two case reports. *Turk J Anaesthesiol Reanim*. 2024;52(1):33–35. doi:10.4274/TJAR.2024.231431
11. Köksal BG, Baytar Ç, Bayraktar E, et al. Effects of serratus posterior superior intercostal plane block on postoperative analgesia in patients undergoing breast cancer surgery: a randomized controlled trial. *BMC Anesthesiol*. 2025;25(1):209. doi:10.1186/s12871-025-03092-0
12. Li ZH, Hong WJ, Guo XL, et al. Serratus plane block in breast cancer surgery: a systematic review and meta-analysis. *Clin Breast Cancer*. 2023;23 (1):e1–e13. doi:10.1016/j.clbc.2022.10.009
13. Arık E, Zengin M, Şeker G, et al. Is the serratus posterior superior intercostal plane block a viable alternative to the erector spinae plane block for postoperative analgesia in breast surgery? A prospective, randomized trial. *BMC Anesthesiol*. 2025;26(1):11. doi:10.1186/s12871-025-03531-y
14. Clephas PR, Orbach-Zinger S, Gosteli-Peter MA, et al. Regional analgesia techniques for postoperative pain after breast cancer surgery: a network meta-analysis. *Cochrane Database Syst Rev*. 2025;6(6):CD014818. doi:10.1002/14651858.CD014818.pub2
15. Bilal B, Ciftci B, Alver S, et al. Serratus posterior superior intercostal plane block: novel block for minimal invasive cardiac surgery -A report of three cases. *Korean J Anesthesiol*. 2024;77(1):166–168. doi:10.4097/kja.23542
16. Fathil SM, Ghani MRA, Chen K-Y, et al. Physical ergonomics in peripheral nerve block. *Appl Sci*. 2021;11(20):9736. doi:10.3390/app11209736
17. Knight David JW, Mahajan RP. Patient positioning in anaesthesia. Continuing education in anaesthesia. *Critical Care & Pain*. 2004;4(5):160–163.
18. Baytar Ç, Aktaş B, Aydin BG, et al. The effects of ultrasound-guided serratus anterior plane block on intraoperative opioid consumption and hemodynamic stability during breast surgery: a randomized controlled study. *Medicine*. 2022;101(35):e30290. doi:10.1097/MD.0000000000030290
19. Desai M, Narayanan MK, Venkataraju A. Pneumothorax following serratus anterior plane block. *Anaesth Rep*. 2020;8(1):14–16. doi:10.1002/anr3.12034