

# Efficacy of Serratus Posterior Superior Intercostal Plane Block on Postoperative Pain and Total Analgesic Consumption in Patients Undergoing Reduction Mammoplasty Surgery: An Evidence Based Report

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## ABSTRACT

Serratus posterior superior intercostal plane block (SPSIPB) is a novel technique that provides analgesia in shoulder, hemithorax and in the back of the neck. In this study, the efficacy of this block on postoperative pain and quality of recovery is reported in ten consecutive patients who had undergone reduction mammoplasty. Blocks were performed bilaterally with 30 ml 0.25 % bupivacaine for each side, at the end of surgery. Cumulative tramadol consumption and numerical rating scale (NRS) scores during rest (static) and coughing (dynamic) were assessed within the first postoperative 24 hours. Mean total tramadol consumption was  $39 \pm 9.94$  mg. NRS scores above 4 were observed in 5 patients in the dynamic NRS assessment at the postoperative 1<sup>st</sup> hour, while static and dynamic NRS scores were  $\leq 4$  at other durations. SPSIPB may play a part in postoperative multimodal analgesia following mammoplasty in the future and may reduce total analgesic consumption.

**Key Words:** Serratus posterior superior intercostal plane block, Reduction mammoplasty, Breast surgery, Postoperative analgesia.

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## INTRODUCTION

Efficient postoperative pain control following mammoplasty is vital for preventing the development of persistent chronic pain. Inefficient postoperative pain control may result in prolonged hospitalisation and functional impairment.<sup>1</sup>

Paravertebral block technique was used in the past for postoperative pain control following mammoplasty.<sup>2,3</sup> Due to the high invasiveness and complications of paravertebral block, newer and less invasive regional anaesthesia techniques such as erector spinae plane block (ESP), pectoral nerve block (PEC), and superficial serratus anterior plane block (SAP) have been tested in recent years to achieve postoperative pain control in mammoplasty.<sup>4-6</sup>

Serratus posterior superior intercostal plane block (SPSIPB) was introduced as a novel technique by Tulgar *et al.* in 2023. They have pointed out that SPSIPB provides analgesia in shoulder, hemithorax, and in the back of the neck.<sup>7</sup>

The objective of this study was to determine the efficacy of SPSIPB on postoperative pain and quality of recovery in patients who had undergone reduction mammoplasty which is a new indication for this block.

## METHODOLOGY

The present study was conducted by retrospectively analysing the data of 10 female patients who underwent reduction mammoplasty at Sivas Cumhuriyet University Hospital from March to May 2023. Informed consent about the study and permission to use their medical data were obtained from the patients. Approval for the study was obtained from the local Ethics Committee (Decision No: 2023-05/45, Decision Date: 17<sup>th</sup> May 2023). In addition, this research was registered at clinicaltrials.gov.tr with the clinical trial number of NCT05901116.

Inclusion criteria were patients weighing above 50 kilogram, aged 18-50 years, American Society of Anaesthesiologists (ASA) I-II risk classification, who had undergone reduction mammoplasty with vertical incision under elective conditions.

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Exclusion criteria were patients who could not cooperate during pain assessment, had revision mammoplasty surgery, with coagulopathy and anti-coagulant treatment, had infection at the intervention area, or had an allergy to local anaesthetic agents. The patients were first performed standard monitoring in the surgery room. Afterwards, all patients had standard general anaesthesia protocol. The patients were placed in the lateral decubitus position for SPSIPB at the end of the surgery.

The blocks were performed under the guidance of ultrasonography (USG). A high frequency (7-12 MHz) transducer was placed at the level of the spine scapula in the transverse plane, and the upper medial border of the scapula, trapezius muscle, serratus posterior superior muscle (SPSM), 2<sup>nd</sup> and 3<sup>rd</sup> ribs were visualised. The ultrasound probe is rotated 90 degrees in a parasagittal orientation to identify the first rib. After its identification, the second and third ribs are confirmed. An 80 mm sonovisible needle was inserted in the caudocranial direction just medial to the scapula with the in-plane technique and driven between the 2<sup>nd</sup> and 3<sup>rd</sup> ribs targeting the inferior part of the SPSM. The target was confirmed by injecting the test dose with saline. Thirty ml of 0.25% bupivacaine was subsequently injected. The same procedure was followed by placing the patient in the lateral decubitus position on the other side with the same dose of local anaesthesia. The patients were extubated in a supine position using sugammadex at the end of the block application.

All patients were administered 1g paracetamol intravenously (i.v.) and 50 mg dexketoprofen trometamol i.v. 10 minutes prior to the end of surgery. All patients in the study were fitted with a patient-controlled analgesia (PCA) device to deliver tramadol, after waking up. The total tramadol dose was standardised for all patients with a maximum daily dose of 400 mg. Patients with a numerical rating scale (NRS) score >4 were administered 1 g paracetamol i.v. (maximum dose: 3 g/day) irrespective of PCA.

The numerical rating scale (NRS) scores were recorded at the 1<sup>st</sup>, 6<sup>th</sup>, 12<sup>th</sup>, 18<sup>th</sup> and 24<sup>th</sup> hours for postoperative pain assessment. NRS assessment was classified as static (at rest) and dynamic (when coughing). The Quality of Recovery-15 (QoR-15) questionnaire consisting of 15 questions, was utilised. The score was assessed on a scale from 0 to 150. A high score indicates an improvement in patient satisfaction and quality of recovery. QoR-15 scores were interpreted as poor if <90, moderate if 90-121, good if 122-135, and excellent quality of recovery if 136-150.<sup>8,9</sup> SPSS (version: 25) was utilised for data analysis. Categorical variables were presented as frequencies. Continuous variables were stated as mean and median (minimum-maximum).

## RESULTS

Median values of age, BMI, ASA, duration of surgery, and total tramadol consumption are presented in Table I. Mean total tramadol consumption was 39 ±9.94 mg (20-50). NRS scores above 4 were observed in 5 patients in the dynamic NRS assessment at the postoperative 1<sup>st</sup> hour, while static and dynamic

NRS scores were ≤4 at other durations (Table II). No patients experienced nausea, vomiting, or itching.

**Table I: Demographic data, surgery time and total tramadol consumption values of the patients.**

	Median (min-max) or frequency
Age (year)	35 (21-48)
BMI (kg/m <sup>2</sup> )	27.5 (23.6-31.2)
ASA, I/II	5/5
Surgery time (minute)	142.5 (75-155)
Total tramadol consumption (mg)	40 (20-50)

ASA: American Society of Anesthesiologists; BMI: body mass index; kg: kilogram; m<sup>2</sup>: square meter; mg: milligram.

## DISCUSSION

This 10-patient case series is the first study in the literature to demonstrate that SPSIPB results in a decrease in postoperative NRS scores and total tramadol consumption in a group of patients undergoing reduction mammoplasty, indicating that this block in the breast region can provide effective postoperative analgesia.

Interfascial plane blocks such as ESP, PEC, and SAP are safer with regard to local anaesthetic systemic toxicity and have a long duration of action due to relatively less vascularity in the interfascial area.<sup>10,11</sup> SPSIPB was introduced to the literature in 2023 by Tulgar *et al.* in a case series study consisting of cadavers and five patients, revealing that it can maintain effective analgesia in the hemithorax, back of the neck, and shoulder.<sup>7</sup> In that particular study, they performed SPSIPB with the patient in the prone position and pointed out that it could also be performed in the sitting position. In this case-series of 10 patients, the authors performed SPSIPB in the lateral decubitus position and proved that the block could also be performed in this position. The key condition in determining the appropriate position for the block is to ensure adequate lateralisation of the scapula. After lateralising the scapula, the block can be performed effectively in any position where the trapezius, rhomboid and serratus posterior superior muscles could be visualised.

The rationale behind SPSIPB being a reliable technique is that the rib is targeted at the insertion of the needle through the skin, and that the anatomical structure contacted when the needle is advanced further reaches the rib, a solid structure. Thus, the risk of pneumothorax is also reduced when it is performed with this technique. No complications associated with SPSIPB were observed in the 10 patients in this study.

Only five of the patients had NRS<sub>dyn</sub> scores above 4 at the 1<sup>st</sup> hour and these 5 patients were only administered 1 g of paracetamol each as an additional analgesic. At other periods, NRS<sub>static</sub> and NRS<sub>dyn</sub> scores were ≤4 and no additional analgesics were administered. The reason for the NRS score being above 4 at the 1<sup>st</sup> hour is that the block was performed at the end of the surgery. Lower NRS scores at the 1<sup>st</sup> hour could have been attained if SPSIPB had been administered preoperatively. This indicates that SPSIPB has a late onset time similar to other interfascial blocks. Thus, it is recommended that SPSIPB be administered preoperatively.

**Table II: Static and dynamic NRS scores and QoR-15 scores of the patients.**

	1 <sup>st</sup> hour		6 <sup>th</sup> hour		12 <sup>th</sup> hour		18 <sup>th</sup> hour		24 <sup>th</sup> hour		QoR-15
	Stat.	Dyn.	Stat.	Dyn.	Stat.	Dyn.	Stat.	Dyn.	Stat.	Dyn.	
Case 1	4	5	3	4	2	3	1	2	2	3	122
Case 2	3	4	3	4	2	3	1	2	1	2	124
Case 3	3	4	2	3	2	3	2	3	2	3	119
Case 4	4	5	3	4	2	3	2	4	2	3	121
Case 5	4	5	3	4	3	4	2	3	2	3	111
Case 6	3	4	2	3	1	2	1	2	1	2	126
Case 7	3	4	2	3	2	3	1	2	1	2	122
Case 8	4	5	2	4	2	3	2	3	2	3	119
Case 9	3	4	2	3	1	2	1	2	1	2	129
Case 10	4	5	3	4	3	4	2	3	1	2	99

QoR-15: Quality of recovery-15 questionnaire.

The limitation of this series lies in the fact that the sensorial distribution was not analysed. Displaying the sensorial distribution would have enabled us to have a clearer understanding of the sensorial block effect of SPSIPB.

## CONCLUSION

This study suggests that SPSIPB may play a part in postoperative multimodal analgesia following mammoplasty in the future and may reduce total analgesic consumption. Randomised controlled trials are required to accurately determine the analgesic efficacy of SPSIPB in mammoplasty.

### ETHICAL APPROVAL:

The study was approved by the Ethics Committee of Sivas Cumhuriyet University [Institutional Review Board (IRB) No. 2023-05/45 IRB date: 17<sup>th</sup> May 2023].

### PATIENTS' CONSENT:

Consent for publication was obtained from the patients whose data are included in this manuscript.

### COMPETING INTEREST:

The authors declared no competing interest.

### AUTHORS' CONTRIBUTION:

OG: Analysed the data and critically reviewed the manuscript for important intellectual content.

OA: Conception and designing of the study, created the study plan, and wrote the manuscript.

FB, MNT, YCK: Literature research, wrote the manuscript.

All authors agreed on the final version of the manuscript for publication.

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