

Effect of Erector Spinae Plane Block on PACU Opioid Consumption in Laparoscopic Sleeve Gastrectomy

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Introduction

- Laparoscopic sleeve gastrectomy (LSG) is a bariatric surgery approved for weight-reduction in diabetic patients with a body-mass index (BMI) greater than 35. Most of these patients require opioid-based pain control but postoperative opioid analgesia poses multiple risks to obese patients including pulmonary complications and increased pain scores.¹ Minimizing opioid use in patients with obesity may reduce likelihood of adverse respiratory effects.
- Ultrasound-guided erector spinae plane block (ESPB) is a relatively novel anesthetic technique that is widely used in preoperative settings. It's feasibility and reported overall improvement in intraoperative opioid consumption and postoperative pain has led to its growing popularity.²
- Recent studies have reported conflicting findings regarding the efficacy of ESPB. While some suggest that ESPB enhances postoperative analgesic efficacy,^{3,4} others indicate that it may not provide additional benefits in laparoscopic sleeve gastrectomy surgery.⁵

Objective

- To investigate the potential benefits of ESPB in facilitating multimodal analgesia for patients undergoing laparoscopic sleeve gastrectomy.
- Primary Aim:** PACU opioid consumption (morphine equivalents)
- Secondary Aim:** Intraoperative opioid consumption, presence of PONV, total operative time, pain score in recovery, and length of stay

Methods

- Study Design:** Retrospective cohort study of 670 laparoscopic sleeve gastrectomy patients at University of Illinois (UI) Health from January 2023 – November 2024.
- Inclusion Criteria:** Adults 18 years of age or older at the time of visit.
- Exclusion Criteria:** Any patients younger than 18 years of age, pregnant women, cognitively impaired adults, and/or prisoners at time of visit.
- Used independent sample *t*-test, chi-square test, Mann-Whitney *U* test, linear regression, and propensity scoring analysis to evaluate patient data. *P*-values <0.05 considered statistically significant.

Source
Data

Data Extraction using
EPIC SlicerDicer

Statistical
Analysis

Results

Table 1 Patients' characteristics					
Variables	ESPB Group (n=240)		Control Group (n=430)		<i>p</i> -value
Sex					
Male	31	(12.9)	44	(10.2)	0.5240
Female	180	(75.0)	302	(70.2)	
Not reported	29	(12.1)	84	(19.5)	
Age (years)	41.9 ± 10.6		40.6 ± 10.7		
Race					
Black	146	(60.8)	267	(62.1)	0.5749
White	74	(30.8)	134	(31.2)	
Other	20	(8.3)	29	(6.7)	
BMI (kg/m²)	48.2 ± 9.6		48.6 ± 10.2		0.6465
ASA physical status					
2	17	(5.8)	25	(5.8)	0.6543
3	217	(90.4)	367	(85.3)	
4	5	(2.1)	4	(1.0)	
History of PONV	11	(4.5)	16	(4.7)	0.6825
Type of surgery					
Robot-assisted LSG	104	(43.3)	162	(37.7)	0.5077
Non-robot-assisted LSG	136	(56.7)	239	(55.6)	

Table 2 Intraoperative and postoperative outcomes of participants					
Variables	ESPB Group (n=240)		Control Group (n=430)		<i>p</i> -value
Total anesthetic time (min)	123	(108-140)	118	(103-143)	0.471
Total operative time (min)	70	(55-87)	69	(55-91)	0.492
In recovery to out of recovery (min)	108	(75-144)	113	(82-152)	0.265
Hospital recovery stay days	2	(2-3)	2	(2-3)	0.679
Pain score in recovery (highest)	8	(6-9)	8	(7-9)	0.364
Number of prophylactic antiemetics administered	2	(2-3)	2	(2-2)	0.096
Presence of PONV in PACU	144	(60)	271	(63)	0.439

Table 3 Medication administration data of participants					
Variables	ESPB Group (n=240)		Control Group (n=430)		<i>p</i> -value
Intraoperative morphine equivalents (mg)	34	(30-38)	38	(30-46)	<0.0001*
Postoperative morphine equivalents (48 hr) (mg)	38	(27-54)	42	(30-55)	0.059
PACU morphine equivalents (mg)	30	(15-38)	30	(15-44)	0.0073*
Total morphine equivalents (mg)	76	(60-92)	84	(65-100)	0.002*
Intraoperative fentanyl consumption (mcg)	100	(100-100)	100	(100-125)	0.033*
Intraoperative hydromorphone consumption (mg)	0.2	(0.2-0.4)	0.4	(0-0.4)	0.0003*
Intraoperative ketamine consumption (mg)	0	(0-30)	20	(0-40)	0.0006*
Intraoperative ondansetron consumption (mg)	4	(4-4)	4	(4-4)	0.923
Intraoperative dexamethasone consumption (mg)	8	(4-8)	8	(4-8)	0.529

Table 4 Propensity Score Analysis of ESPB Effects**			
Variables	Amount reduced for each medication type	Absolute difference (95% CI)	<i>p</i> -value
PACU morphine equivalents (mg)	-5.65	(-0.19, -2.10)	0.002*
Intraoperative morphine equivalents (mg)	-4.15	(-7.38, -0.91)	0.012*
Intraoperative fentanyl consumption (mcg)	-13.94	(-23.70, -4.19)	0.005*
Intraoperative ketamine consumption (mg)	-6.27	(-10.09, -2.44)	0.001*

Data for Tables 1-3 are presented as numbers (%), mean ± standard deviation, or median (interquartile range). ESPB erector spinae plane block, BMI body mass index, ASA American Society of Anesthesiologists, PONV postoperative nausea and vomiting, LSG laparoscopic sleeve gastrectomy, PACU post anesthetic care unit, CI confidence interval

**Propensity score matching based on age at encounter, race, sex assigned at birth, weight, BMI, procedure type and procedure length was used to match patients who received or did not receive an ESPB in a 1:1 ratio. The sample size was calculated to detect the reduction of 4 mg PACU morphine equivalents [d = 0.23, equivalent to 0.2 mg hydromorphone (a standard dose at our institution)], resulting in at least 225 participants in each study group to obtain 80% power with a significance level of 0.05.

Conclusion

There was a statistically significant difference in opioid consumption during and following laparoscopic sleeve gastrectomy between the intervention and control groups. However, the reduction was minimal, equating to approximately 33 mcg of fentanyl, without any improvement in other recovery parameters. Our work comports with randomized trials⁶⁻⁸ in the field which demonstrate statistically relevant reductions in opioid use but with questions about the clinical significance. Further studies are required to determine the optimal pain control strategy in laparoscopic sleeve gastrectomy.

Limitations

Limitations included a single-center retrospective study design, the exclusion of preexisting comorbidities in the patient population, and the inability to standardize the ESPB administration technique or precisely determine surface distribution of block area.

References

1. Talab, Hesham F., Ibrahim Ali Zabani, Hassan Saad Abdelrahman, Waleed L. Bukhari, Irfan Mamoun, Majed A. Ashour, Bakr Bin Sadeq, and Sameh Ibrahim El Sayed. 2009. "Intraoperative Ventilatory Strategies for Prevention of Pulmonary Atelectasis in Obese Patients Undergoing Laparoscopic Bariatric Surgery." *Anesthesia and Analgesia* 109 (5): 1511–16. <https://doi.org/10.1213/ANE.0b013e3181ba7945>.
2. Forero, Mauricio, Sanjib D. Adhikary, Hector Lopez, Calvin Tsui, and Ki Jin Chin. 2016. "The Erector Spinae Plane Block: A Novel Analgesic Technique in Thoracic Neuropathic Pain." *Regional Anesthesia and Pain Medicine* 41 (9): 621–27. <https://doi.org/10.1097/AAP.0000000000000451>.
3. Gao, Yuzheng, Lidan Liu, Yuning Gu, Jiaxin Zhang, and Xuying Wu. 2022. "Postoperative Analgesia Efficacy of Erector Spinae Plane Block in Adult Abdominal Surgery: A Systematic Review and Meta-Analysis of Randomized Trials." *Frontiers in Medicine* 9 (October): 934866. <https://doi.org/10.3389/fmed.2022.934866>.
4. Daghmouri, Mohamed Aziz, Soumaya Akremi, Mohamed Ali Chaouch, Meryam Mesbahi, Nouha Amouri, Hazem Jaoua, and Kamel Ben Fadhel. 2021. "Bilateral Erector Spinae Plane Block for Postoperative Analgesia in Laparoscopic Cholecystectomy: A Systematic Review and Meta-Analysis of Randomized Controlled Trials." *Pain Practice: The Official Journal of World Institute of Pain* 21 (3): 357–65. <https://doi.org/10.1111/pppr.12953>.
5. Jinawon et al. "Efficacy of Erector Spinae Plane Block on Postoperative Analgesia for Patients Undergoing Metabolic Bariatric Surgery: A Randomized Controlled Trial."
6. Karaveli, Arzu, et al. "The Effect of Ultrasound-Guided Erector Spinae Plane Block on Postoperative Opioid Consumption and Respiratory Recovery in Laparoscopic Sleeve Gastrectomy: A Randomized Controlled Study." *Obesity Surgery* (2024): 1-10.
7. Wang, Yan, et al. "Effect of Ultrasound-guided Erector Spinae Plane Block on Recovery After Laparoscopic Sleeve Gastrectomy in Patients With Obesity: A Randomized Controlled Trial." *Clinical Therapeutics* 45.9 (2023): 894-900.
8. Mostafa, Shaimaa F., Mohamed S. Abdelghany, and Mohamed M. Abu Elyazed. "Ultrasound-guided erector spinae plane block in patients undergoing laparoscopic bariatric surgery: a prospective randomized controlled trial." *Pain Practice* 21.4 (2021): 445-453.

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