

Ultrasound-Guided Retrolaminar Block For Postoperative Analgesia In Pediatric Patients Undergoing Abdominal Surgeries: A Case Series

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Abstract

Background: Effective postoperative pain management in pediatric surgical patients is essential for enhanced recovery and patient comfort. Regional anesthesia techniques play an important role in multimodal analgesia. Although paravertebral blocks provide effective analgesia for abdominal surgeries, concerns regarding complications such as pleural puncture and spinal nerve injury have led to the exploration of safer alternatives. The ultrasound-guided retrolaminar block (RLB) has emerged as a promising regional anesthetic technique with a favorable safety profile.

Objective: To evaluate the efficacy and ease of administration of ultrasound-guided retrolaminar block for postoperative analgesia in pediatric patients undergoing abdominal surgeries.

Methods: This prospective case series included ten pediatric patients aged 2–16 years scheduled for abdominal surgery. Following induction of general anesthesia and endotracheal intubation, an ultrasound-guided retrolaminar block was performed at the T9–T10 level. Under aseptic precautions, a 22G needle was advanced using an in-plane technique until contact with the lamina was achieved. After negative aspiration, 0.5 mL/kg of 0.25% bupivacaine was injected posterior to the lamina. Postoperative pain was assessed using the Wong–Baker Faces Pain Scale at regular intervals for 24 hours. Rescue analgesia with intravenous ibuprofen (10 mg/kg) was administered when pain scores exceeded 4.

Results: The mean age of the patients was 6.7 +/- 4.6 years. The retrolaminar block was successfully performed in all patients without technical difficulties. Pain scores remained ≤ 4 during the first four postoperative hours in all subjects. The mean duration of effective analgesia (time to first rescue analgesia) was 5.1 $\pm$ 1.2 hours. Hemodynamic parameters remained stable throughout the study period, and no block-related complications were observed.

Conclusion: Ultrasound-guided retrolaminar block appears to be a safe, technically simple, and effective technique for postoperative analgesia in pediatric patients undergoing abdominal surgeries. Further randomized controlled studies with larger sample sizes are warranted to validate these findings.

Keywords: Retrolaminar block, Pediatric anesthesia, Postoperative analgesia, Ultrasound-guided regional anesthesia, Abdominal surgery.

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I. Introduction

Postoperative pain management in pediatric patients remains a significant challenge and an evolving area of anesthetic practice. Adequate pain control is associated with improved recovery, a reduced stress response, and enhanced patient satisfaction. Multimodal analgesia, combining pharmacological agents with regional anesthesia techniques, is considered the cornerstone of effective postoperative pain management.

Thoracic paravertebral block has been widely used for abdominal surgeries due to its ability to provide effective unilateral somatic and sympathetic blockade. However, the risk of complications such as pleural puncture, pneumothorax, vascular injury, and spinal nerve damage has limited its widespread use, particularly in pediatric patients.

The retrolaminar block, first described as a modification of the paravertebral block, involves the deposition of local anesthetic posterior to the vertebral lamina. Due to the greater distance from the pleura and neural structures, it offers a potentially safer and technically easier alternative. The addition of ultrasound

guidance further enhances precision and safety. This case series aims to demonstrate the efficacy and ease of administration of ultrasound-guided retrolaminar block for postoperative analgesia in pediatric patients undergoing abdominal surgeries

II. Materials And Methods

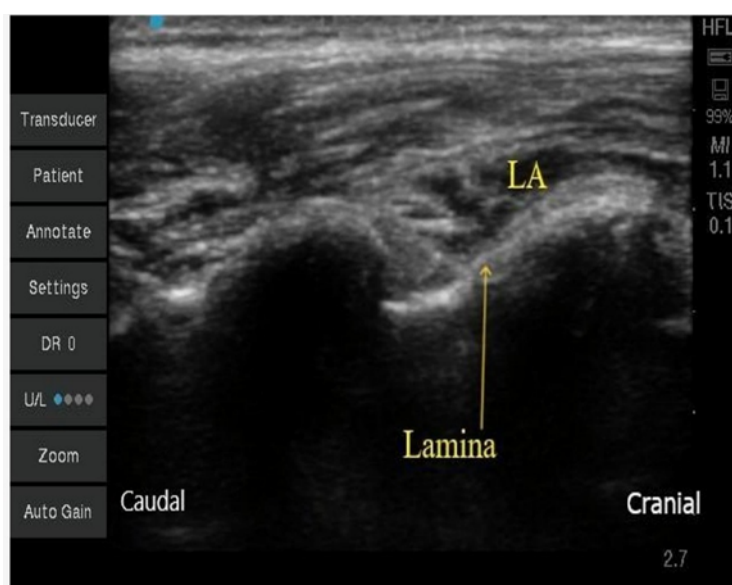
Study Design & Population

This prospective case series included ten pediatric patients aged between 2 and 16 years undergoing elective abdominal surgery, enrolled after obtaining written informed consent from parents or legal guardians.

Anaesthetic & Block Technique

All patients adhered to standard fasting guidelines. Upon arrival in the operating room, standard monitoring—including electrocardiography, pulse oximetry, and non-invasive blood pressure monitoring—was instituted, and baseline vitals were recorded. General anaesthesia was induced using propofol, sevoflurane, fentanyl, and appropriate muscle relaxants, followed by endotracheal intubation.

Following induction, patients were placed in the left lateral decubitus position. Under strict aseptic precautions, the T9–T10 vertebral level was identified using a 6–13 MHz linear ultrasound transducer. Using an in-plane approach, a 22-gauge needle was advanced under direct ultrasound visualization until contact with the lamina was achieved. Following negative aspiration for blood and cerebrospinal fluid, 0.5 mL/kg of 0.25% bupivacaine was injected posterior to the lamina. Hemodynamic parameters were continuously monitored throughout the procedure.



Postoperative Assessment

Pain was assessed using the Wong–Baker Faces Pain Scale according to the following schedule:

- Every 15 minutes during the first 2 postoperative hours
- Hourly during the subsequent 2 hours
- Every 6 hours up to 24 hours postoperatively

Face Score	Numerical Score	Pain Severity
	0	No pain
	2	Hurts a little bit
	4	Hurts a little more
	6	Hurts even more
	8	Hurts a whole lot
	10	Hurts worst

Rescue analgesia consisting of intravenous ibuprofen (10 mg/kg) was administered if the Wong–Baker score exceeded 4. The exact time to first rescue analgesia request was recorded.

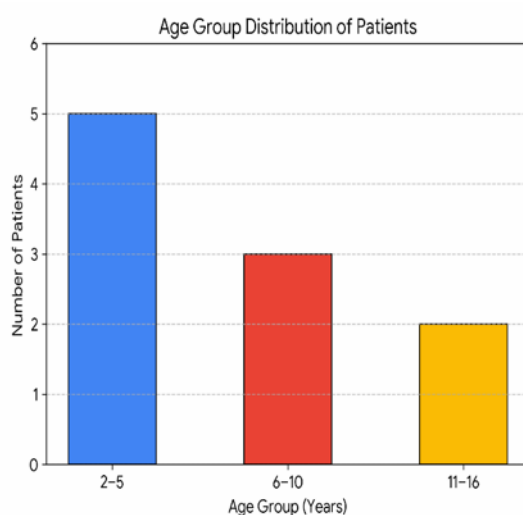
III. Results

Demographic Characteristics

A total of 10 pediatric patients undergoing abdominal surgery were included in the study. The mean age of the study population was 6.7 ± 4.6 years (range: 2–16 years). There was an equal distribution of male and female patients, with **5 males (50%)** and **5 females (50%)**.

Age Group Distribution

Age Group (Years)	Number of Patients	Percentage (%)
2–5	5	50
6–10	3	30
11–16	2	20



Most patients (50%) belonged to the 2–5 years age group.

ASA Physical Status

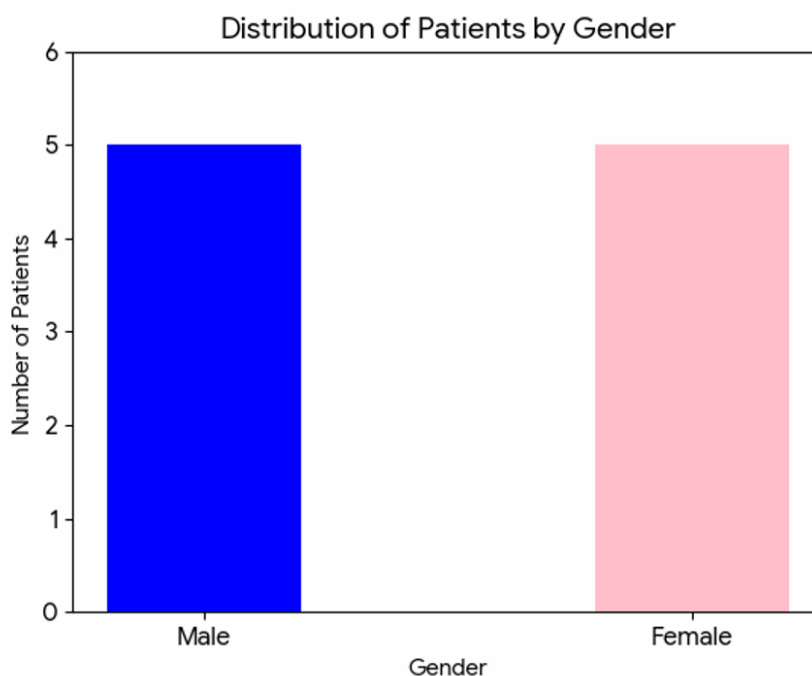
All patients belonged to ASA physical status

ASA Distribution

ASA Status	Number of Patients	Percentage (%)
ASA I		
ASA II		
Total	10	100

Gender Distribution

Gender	Number of Patients	Percentage (%)
Male	5	50
Female	5	50



An equal gender distribution was observed among the study participants.

Postoperative Pain Assessment (Wong–Baker Faces Pain Scale)

Postoperative pain was assessed using the Wong–Baker Faces Pain Scale (WB-FPS) during the first two postoperative hours. The mean peak WB-FPS score was 1.4 ± 1.0 .

Distribution of Peak WB-FPS Scores

Peak WB-FPS Score	Number of Patients	Percentage (%)
0	3	30
2	7	70
>2	0	0

All patients maintained a peak WB-FPS score of ≤ 2 during the first two postoperative hours, indicating satisfactory postoperative analgesia.

Duration of Postoperative Analgesia

The mean duration of analgesia, defined as the time to first rescue analgesic requirement, was 5.1 ± 1.1 hours (range: 4–7 hours).

Time to First Rescue Analgesia

Time to Rescue Analgesia (Hours)	Number of Patients	Percentage (%)
4	4	40
5	2	20
6	3	30
7	1	10

The majority of patients (60%) required rescue analgesia after 5 hours or more following administration of the ultrasound-guided retrolaminar block.

Case	Age(yrs)	Gender	Type of Anaesthesia	Post operative WB-FPS							Rescue Analgesia (in hrs)
				0 mins	15 mins	30 mins	60 mins	2 hours	4 hours	10 hours	
1	16	F	GA + RLB	0	0	0	2	2	2	2	6
2	6	M	GA + RLB	0	0	0	2	2	2	2	5
3	11	F	GA + RLB	0	0	0	0	0	0	0	7
4	2	F	GA + RLB	2	0	0	2	2	4	4	4
5	5	M	GA + RLB	0	0	0	2	2	4	4	5
6	8	M	GA + RLB	0	0	0	0	0	2	2	6
7	2	M	GA + RLB	0	0	0	0	2	4	4	4
8	10	F	GA + RLB	0	0	0	0	0	2	2	6
9	4	M	GA + RLB	2	0	0	2	2	4	2	4
10	3	F	GA + RLB	2	0	0	0	2	4	4	4

Safety and Block Performance

Ultrasound-guided retrolaminar block was successfully performed in all patients without technical difficulty. Hemodynamic parameters remained stable throughout the perioperative period. No complications such as vascular puncture, local anesthetic toxicity, pneumothorax, infection, or neurological deficits were observed.

Hemodynamic parameters remained stable throughout the perioperative period. No complications—such as vascular puncture, pneumothorax, local anaesthetic systemic toxicity (LAST), neurological deficits, or site infections—were observed.

IV. Discussion

The retrolaminar block is a valuable modification of the paravertebral block based on the laminar approach. By depositing local anesthetic posterior to the vertebral lamina, the technique provides effective truncal analgesia while maintaining a safer anatomical distance from critical structures like the pleura, spinal nerves, and sympathetic chain.

This structural buffer reduces the likelihood of serious complications including pneumothorax, nerve injury, and inadvertent epidural spread. Consequently, the retrolaminar block serves as a technically simpler and safer alternative to the traditional thoracic paravertebral block, especially in pediatric anatomy where margins of error are slim.

In this case series, all blocks were successfully performed under ultrasound guidance without procedural difficulties. The observed duration of analgesia of approximately five hours provided effective early postoperative pain relief, bridging the immediate, most painful post-surgical phase and delaying the need for systemic rescue opioids or NSAIDs. Furthermore, the total absence of block-related complications underscores its clinical safety profile. Ultrasound guidance contributes significantly to this outcome by enabling direct, real-time visualization of anatomical landmarks and needle-to-bone contact.

Limitations: Although these findings are encouraging, this evaluation is limited by its small sample size, lack of a control group, and unblinded design. Larger randomized controlled trials are required to compare the retrolaminar block directly against established regional techniques like the erector spinae plane (ESP) block or transverse abdominis plane (TAP) block.

V. Conclusion

Ultrasound-guided retrolaminar block appears to be a safe, effective, and technically straightforward regional anesthesia technique for postoperative pain management in pediatric patients undergoing abdominal surgeries. The block provided satisfactory analgesia, maintained hemodynamic stability, and was not associated with any complications in this cohort. Further large-scale, randomized comparative studies are recommended to firmly establish its role in pediatric perioperative pathways.

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