

Expanding the Role of Erector Spinae Plane Block in Robotic Cholecystectomy: A Case Series of Multimodal Analgesia in High-risk Surgical Patients

PRACHI SIDDHARTH KAMBLE¹, NEETA VERMA², AMREESH PAUL³

ABSTRACT

Robotic cholecystectomy offers the benefits of minimal invasive surgery, but presents with anaesthetic complications like altered respiratory mechanics, haemodynamic disturbance, and severe postoperative pain. Adequate perioperative pain management is warranted to minimise the usage of opioids and ensure early recovery. Erector Spinae Plane Block (ESPB) is a regional block with multi-dermatomal somatic and visceral analgesic effects and can be used as an adjuvant to General Anaesthesia (GA). Three patients with various associated diseases undergoing robotic cholecystectomy were administered GA in the form of sevoflurane, fentanyl, vecuronium, and propofol with ultrasound-guided ESPB at corresponding levels of the thorax. This included a 65-year-old male patient with ischaemic heart disease who was administered a unilateral block provided to him with the intention of avoiding sympathetic stimulation, a 56-year-old obese man with a challenging airway was administered bilateral ESPB for bilateral analgesic cover, and a 62-year-old female patient with history of prior upper abdominal surgery and chronic pain was administered unilateral block with addition of dexamethasone for extension of duration of analgesia. ESPB provided adequate perioperative analgesia in all patients as demonstrated by low visual analogue scores, reduced postoperative opioid consumption, and intraoperative haemodynamic stability. No block side-effect was observed. The technique was especially useful for patients with cardiovascular comorbidities, obesity, or chronic pain and resulted in early mobilisation and rehabilitation. The case series illustrates the efficacy, simplicity, and safety of ESPB as an adjuvant to GA for robotic cholecystectomy. Its use in multimodal anaesthetic practice would enhance postoperative comfort, minimise opioid use, and enable quicker recovery, especially for patients at high risk of receiving minimally invasive upper abdominal surgery.

Keywords: Abdominal pain, Anaesthesia, Analgesics, Minimally invasive surgical procedures, Ultrasound guidance

INTRODUCTION

Robot-assisted cholecystectomy is a significant option for minimally invasive gallbladder disease treatment with better ergonomics and precision. It presents unique anaesthetic challenges, mainly in terms of control of postoperative pain. Pneumoperitoneum, steep reverse Trendelenburg position, and upper abdominal surgery can create somatic and visceral pain, and poor analgesia has been associated with prolonged recovery, opioid requirement, and postoperative morbidity. Classical opioid-dependent analgesia is effective is associated with significant side effects, including nausea, vomiting, respiratory depression, and haemodynamic instability, with particular emphasis on at-risk patients [1,2].

Regional anaesthetic methods, such as the ESPB, have gained attention as potent adjuvants to GA for upper abdominal surgery. ESPB involves the injection of local anaesthetics into the fascial plane deep to the erector spinae muscle, facilitating spread to the dorsal and ventral rami of the spinal nerves, resulting in analgesia in several thoracic dermatomes. ESPB can cause significantly lower postoperative pain scores and opioid intake. Its opioid-sparing effect, simplicity, and safety profile make it another benefit to the anaesthetic regimen of robotic cholecystectomy in chronic pain patients, obese patients, and comorbid patients [3-6].

The use of ESPB in three patients for robotic cholecystectomy and its utility in postoperative pain management, reduction in Visual Analogue Scale (VAS) scores, and reduction in opioid use are reported in the following case series.

CASE SERIES

Case 1

A 65-year-old male patient {Body Mass Index (BMI) 28.4}, classified as American Society of Anaesthesiologists Physical Status (ASA-PS) II, with a history of ischaemic heart disease diagnosed eight years earlier, was scheduled for robotic cholecystectomy. He was on regular treatment with aspirin 75 mg once daily and metoprolol 50 mg once daily. Preanaesthetic evaluation revealed a stable cardiovascular status. Haematological investigations, renal and liver function tests, and coagulation profile were within normal limits. Electrocardiography showed chronic ischaemic changes, and echocardiography demonstrated preserved left ventricular systolic function with an ejection fraction of 55%. Chest radiography was unremarkable.

The GA was induced with glycopyrrolate 0.2 mg, midazolam 2 mg, propofol 2 mg/kg, fentanyl 2 µg/kg, and vecuronium 0.1 mg/kg. Following induction, a right-sided ultrasound-guided ESPB was performed at the T7 level using 20 mL of 0.375% ropivacaine. Anaesthesia was maintained with sevoflurane in an oxygen-air mixture {Minimum Alveolar Concentration (MAC) 1-2}, with intermittent doses of vecuronium (0.01 mg/kg). The surgical duration was approximately two hours.

Postoperatively, VAS scores ranged between 2 and 3 for the first 12 hours. Analgesia was managed with intravenous paracetamol 1 g every eight hours, and no rescue opioids were required. The patient was monitored for 48 hours postoperatively and had an uneventful recovery.

Case 2

A 56-year-old male patient (BMI 38), ASA-PS III, with a 6-year history of metabolic syndrome and an anticipated difficult airway, was planned for robotic cholecystectomy. He was receiving metformin 500 mg twice daily and atorvastatin 20 mg once daily. Preoperative evaluation, including haemogram, renal and liver function tests, coagulation profile, electrocardiography, and chest radiography, was within normal limits.

The GA was induced using glycopyrrolate 0.2 mg, midazolam 2 mg, propofol 2 mg/kg, fentanyl 2 µg/kg, and vecuronium 0.1 mg/kg. Bilateral ultrasound-guided ESPB was performed at the T7 level using 25 mL of 0.375% ropivacaine on each side to provide wide dermatomal analgesia in view of prolonged pneumoperitoneum. Anaesthesia was maintained with sevoflurane in an oxygen-air mixture (MAC 1-2). The duration of surgery was approximately 150 minutes.

Postoperative VAS scores remained below three for 18 hours, and analgesia was adequately managed with intravenous paracetamol alone. The patient was monitored for 48 hours postoperatively and demonstrated good respiratory effort, early ambulation, and an uncomplicated recovery.

Case 3

A 62-year-old female patient (BMI 20.2), ASA-PS II, with a history of open gastrectomy performed 10 years earlier and chronic abdominal pain for the preceding six years was scheduled for robotic cholecystectomy. She was not on regular opioid therapy and used oral paracetamol 500 mg intermittently for pain relief. Pre-anaesthetic evaluation and investigations, including haemogram, renal and liver function tests, coagulation profile, electrocardiography, and chest radiography, were normal.

The GA was induced with glycopyrrolate 0.2 mg, midazolam 2 mg, propofol 2 mg/kg, fentanyl 2 µg/kg, and vecuronium 0.1 mg/kg. A right-sided ultrasound-guided ESPB was administered at the T7 level using 20 mL of 0.375% ropivacaine with dexamethasone 4 mg as an adjuvant. Anaesthesia was maintained with sevoflurane in an oxygen-air mixture (MAC 1-2). The surgical procedure lasted approximately 110 minutes.

Postoperatively, VAS scores were ≤ 2 for up to 24 hours, and analgesic requirements were limited to a single dose of intravenous paracetamol 1 g. The patient was monitored for 48 hours after surgery and experienced a smooth and uncomplicated recovery, with high satisfaction regarding pain control.

DISCUSSION

Robot-assisted cholecystectomy is associated with specific anaesthetic challenges arising from pneumoperitoneum, extreme reverse Trendelenburg positioning, and limited access to the patient

after robotic docking. These factors adversely affect respiratory mechanics and haemodynamic stability and may complicate intraoperative management. Such physiological alterations are particularly pronounced in patients with significant comorbidities, necessitating tailored anaesthetic and analgesic strategies to ensure perioperative safety [7-9]. In this case series, anaesthetic challenges were amplified by patient-specific comorbidities. In the patient with ischaemic heart disease, pneumoperitoneum-related increases in systemic vascular resistance and sympathetic stimulation increased myocardial oxygen demand, predisposing to perioperative ischaemia. Previous studies have demonstrated that ESPB provides effective opioid-sparing analgesia and attenuates stress responses in cardiac patients, thereby improving haemodynamic stability [3,5]. In the morbidly obese patient, reduced functional residual capacity, decreased lung compliance, and increased risk of opioid-induced respiratory depression were further exacerbated by pneumoperitoneum and steep positioning. Bilateral ESPB provided effective and symmetrical analgesia, reducing opioid consumption and facilitating improved postoperative respiratory function, consistent with earlier reports describing its efficacy in obese patients undergoing abdominal surgery [5].

In the patient with chronic abdominal pain and a history of prior upper abdominal surgery, altered pain pathways and central sensitisation contributed to increased postoperative analgesic requirements. ESPB provided prolonged multilevel analgesia, effectively addressing both visceral and somatic pain components. Similar findings have been reported in the literature, where ESPB was shown to improve postoperative analgesia in patients with chronic pain and prior abdominal interventions by overcoming central sensitisation and reducing opioid dependence [10]. ESPB facilitates the spread of local anaesthetic in a deep fascial plane, resulting in multisegmental blockade suitable for upper abdominal surgery. Previous studies have demonstrated that ESPB reduces postoperative pain scores and opioid consumption while maintaining haemodynamic and respiratory stability [3,5]. In the present case series, ESPB was performed under ultrasound guidance, enhancing accuracy and safety, and no block-related complications were observed, in line with published reports highlighting its favourable safety profile [3,5,9].

Overall, this case series supports existing evidence that ESPB is a valuable adjunct to GA in robot-assisted cholecystectomy, particularly in patients with significant comorbidities. By addressing comorbidity-specific anaesthetic challenges, ESPB contributed to improved perioperative stability, effective analgesia, and enhanced recovery. These findings are consistent with prior reports and support the inclusion of ESPB as part of a multimodal analgesic regimen for minimally invasive upper abdominal surgery [3,5,9-12]. Anaesthetic management of cholecystectomies with ESPB is depicted in [Table/Fig-1] [13-15].

Authors	Study details	Anaesthetic management	Takeaway points
Current case series	Three patients undergoing robotic abdominal surgery. Comorbidities included ischaemic heart disease on beta-blockers and aspirin, morbid obesity with metabolic syndrome and a difficult airway, and a history of chronic abdominal pain following prior gastrectomy. ESPB was used as part of a multimodal, opioid-sparing analgesic strategy.	GA was maintained with sevoflurane in an oxygen-air mixture and vecuronium for muscle relaxation. ESPB was performed at T7 under ultrasound guidance using 20-25 mL of 0.375% ropivacaine, with 4 mg of dexamethasone added in one case. Postoperative analgesia was managed with paracetamol.	ESPB was effective in providing stable intraoperative conditions, minimising opioid use, and ensuring excellent postoperative pain control with early recovery and high patient satisfaction. No block-related or anaesthetic complications were observed.
Cantez A et al., [13]	A prospective double-blind randomised study included 82 patients undergoing laparoscopic cholecystectomy. Patients were divided into the standard multimodal analgesia group and the ESPB group. The primary outcome was postoperative quality of recovery.	ESPB was performed preoperatively alongside standard multimodal analgesia. Postoperative pain and opioid (tramadol) consumption were monitored.	ESPB improved postoperative recovery quality, reduced pain scores at rest and movement, and significantly lowered 24-hour opioid consumption.
Chauhan S et al., [14]	A prospective, interventional, single-blind, quasi-randomised study of 82 patients undergoing laparoscopic cholecystectomy compared ESPB to the control.	ESPB was administered as part of a multimodal analgesia regimen. Postoperative tramadol consumption, Visual Analogue Scale (VAS) scores, and time to rescue analgesia were recorded and compared between groups.	ESPB was safe and effective, providing better pain relief, lower opioid requirement, reduced pain scores, and prolonged time to rescue analgesia compared to controls.

Sethi D et al., [15]	Randomised study of 75 ASA I/II patients undergoing laparoscopic cholecystectomy. Compared GA (control) vs. bilateral ultrasound-guided ESPB and GA. The primary outcome was 24-hour postoperative tramadol consumption.	Bilateral ultrasound-guided ESPB was administered before induction, followed by standard GA. Postoperative analgesic consumption and Numeric Pain Rating Scores (NRS) were assessed.	Bilateral ESPB significantly reduced 24-hour tramadol consumption and the need for rescue fentanyl. NRS pain scores at rest and movement were statistically lower but clinically comparable.
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[Table/Fig-1]: Comparison of anaesthetic management and outcomes with ESPB in robotic and laparoscopic cholecystectomy [13-15].

CONCLUSION(S)

The use of ESPB as an adjunct to GA for robotic cholecystectomy provided effective perioperative analgesia with reduced opioid requirements and stable haemodynamic profiles in this case series. ESPB addressed both somatic and visceral components of postoperative pain and was particularly beneficial in patients with cardiovascular comorbidities, obesity, or chronic pain. As part of a multimodal analgesic strategy, ESPB may enhance postoperative comfort, facilitate early mobilisation, and support recovery in high-risk patients undergoing robot-assisted upper abdominal surgery.

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PARTICULARS OF CONTRIBUTORS:

- Junior Resident, Department of Anaesthesia, Jawaharlal Nehru Medical College, DMIHER, Sawangi, Wardha, Maharashtra, India.
- Professor, Department of Anaesthesia, Jawaharlal Nehru Medical College, DMIHER, Sawangi, Wardha, Maharashtra, India.
- Senior Resident, Department of Anaesthesia, Jawaharlal Nehru Medical College, DMIHER, Sawangi, Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Prachi Siddharth Kamble,
Junior Resident, Department of Anaesthesia, JNMC, Sawangi Meghe, Wardha,
Maharashtra, India.
E-mail: kambleprachi022@gmail.com

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