Case Report

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Segmental Spinal Anaesthesia with Posterior Quadratus Lumborum Block for Laparoscopic Cholecystectomy in a Patient with Bronchiectasis: A Case Report

Anaesthesia Section

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ABSTRACT

Anaesthetic management in patients with bronchiectasis presents unique challenges due to compromised respiratory function and increased postoperative risks. Regional anaesthesia techniques, such as Segmental Spinal Anaesthesia (SSA) and ultrasound-guided Posterior Quadratus Lumborum Block (PQLB), offer viable alternatives to General Anaesthesia (GA). Their combined use ensures adequate analgesia while minimising respiratory complications, contributing to improved perioperative outcomes. This is a case report of anaesthetic management in a 43-year-old female with bronchiectasis who underwent laparoscopic cholecystectomy. The administration of GA in such cases is associated with significant respiratory risk. Hence, SSA was utilised in combination with ultrasound-guided PQLB. SSA can provide excellent analgesia for laparoscopic cholecystectomy and can limit the usage of systemic opioids. It can be advantageous in conditions with reduced respiratory functions, as spontaneous ventilation can be maintained and respiratory complications minimised. The use of ultrasound-guided PQLB further potentiated analgesia on the abdominal wall, with an additional reduction in opioid needs and prevention of respiratory depression caused by opioids. This case emphasises the importance of a customised regional anaesthesia technique in challenging and complex cases that could help improve pain relief with safe maximisation in patients with chronic issues and respiratory challenges.

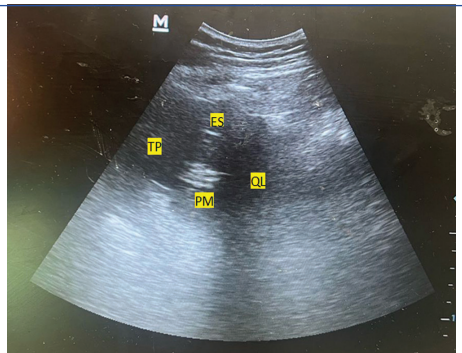
Keywords: High-risk anaesthesia, Perioperative care, Postoperative analgesia, Regional anaesthesia, Ultrasound-guided regional anaesthesia

CASE REPORT

A 43-year-old female with a history of bronchiectasis for seven years presented with complaints of sharp pain localised to the right upper quadrant of the abdomen, radiating to her back and shoulder. She complained of persistent nausea and vomiting. She had yellowish discolouration of the skin and eyes, fever, chills, and indigestion and bloating, especially following meals. Abdominal ultrasound revealed gallstones with inflammation of the gallbladder wall, thickening consistent with acute cholecystitis, and the presence of pericholecystic fluid. A computed tomography scan showed a thickening of the gallbladder wall and gallstones, with a dilatation of the bile ducts, suggesting probable obstruction.

There was a history of chronic productive cough and recurrent respiratory infection for two months. She had no other comorbidities except her bronchiectasis and was on long-acting beta-agonists and inhaled corticosteroids for symptomatic bronchiectasis. She had no known drug allergies. An elaborate preoperative assessment was done, given her history of respiratory problems. She was classified as American Society of Anesthesiologists (ASA) physical status grade III. Baseline respiratory parameters included a respiratory rate of 18 breaths per minute, oxygen saturation of 96% on room air, and no signs of acute distress. Pulmonary function tests showed a Forced Expiratory Volume in one second (FEV_1) of 62% predicted, a Forced Vital Capacity (FVC) of 75% predicted, and an FEV_1/FVC ratio of 68%, indicating an obstructive pattern. She was seen by a Pulmonologist who assessed her risk of complications concerning the respiratory aspect in the perioperative period. After discussing with the surgeons, a decision was made to employ SSA and PQLB as the modality of anaesthesia to provide adequate analgesia without depressing the respiratory function, and maintain spontaneous ventilation during the surgery. The patient was kept nil per os for eight hours before the scheduled time of the surgery.

In the operating theatre, an 18-gauge i.v. catheter was secured for fluid administration, and preloading with Ringer's lactate was done. Intraoperative monitoring comprised electrocardiography, non-invasive blood pressure, oxygen saturation, and respiratory rate. Intravenous administration of 40 mg pantoprazole and 4 mg ondansetron was administered. A PQLB was administered before the induction of spinal anaesthesia, with the patient positioned in the right lateral decubitus position, optimally exposing the anatomical landmarks. Under strict aseptic precautions, a linear ultrasound probe was used to optimally visualise three layers of the abdominal muscle, thoracolumbar fascia, and quadratus lumborum muscles, as seen in [Table/Fig-1]. After this, a needle was advanced toward the posterior edge between the middle layer of the right thoracolumbar fascia and the quadratus lumborum muscle for a PQLB. The needle was placed between the aponeurosis at the lateral border of the quadratus lumborum muscle and the transversalis fascia. Hydro-dissection was performed to confirm accurate needle placement, following which 20 mL of 0.25% bupivacaine was administered.



[Table/Fig-1]: Ultrasound image of thoracolumbar fascia and quadratus lumborum muscles.
(TP: Transverse process; ES: Erector spinae; QL: Quadratus lumborum; PM: Psoas major)

Under strict aseptic precautions, SSA was administered with the patient in the left lateral position at the T10-11 intervertebral space, using a 26-gauge Quincke's needle. A 2 mL of isobaric levobupivacaine and 25 mcg of fentanyl were administered after free flow of cerebrospinal fluid. The patient was then positioned supine. The pinprick method monitored the onset and spread of sensory block every minute until the required block level was achieved. Dermatomal levels from T6 to L1 were successfully blocked following SSA, providing adequate coverage for surgery. No complications were encountered during the anaesthesia procedure. Following this, the surgery started. Verbal contact was maintained with the patient throughout the surgery period.

No sedation was administered at any point in time. She was haemodynamically stable during the entire procedure with close respiratory monitoring. She was then transferred to the recovery room postsurgery and monitored for any immediate postoperative complications. The analgesia provided by PQLB lasted approximately six hours before rescue analgesia was required. During the recovery period, the patient experienced slight pain (as quantified using a Visual Analogue Scale-4), which was managed with intravenous paracetamol 1g. Her respiratory function remained stable, with slight fluctuations from her preoperative baseline. There was no indication of distress or adverse reaction from the anaesthesia or the surgical procedure. On postoperative day 2, the patient was discharged from the hospital with comprehensive instructions for discharge.

DISCUSSION

Bronchiectasis is a chronic pulmonary disorder with irreversible dilatation of the bronchi, recurrent infections, and persistent mucus production leading to impaired mucociliary clearance. These pathophysiological changes increase the risk of perioperative complications, including respiratory diseases, bronchospasm, atelectasis, and hypoxemia. Anaesthetic management in such patients must focus on preserving pulmonary function, minimising respiratory depression, and reducing the risk of postoperative pulmonary complications. GA, though regularly used for laparoscopic procedures, carries potential risks in a patient with bronchiectasis, such as ventilation-perfusion mismatch and respiratory depression due to opioid use [1,2].

The SSA involves the administration of local anaesthetic into the cerebrospinal fluid, targeting specific spinal levels to achieve sensory and motor blockade. In this case, SSA was preferred for effective analgesia to ensure adequate intraoperative pain control and muscle relaxation for laparoscopic cholecystectomy. It also has less risk for respiratory depression, which is a significant concern in bronchiectasis [3]. SSA, having obviated the need for airway manipulation and mechanical ventilation, helps maintain spontaneous ventilation during operations and reduces the incidence of hypoxemia and atelectasis, consequently reducing postoperative pulmonary complications [4]. It offers better haemodynamic stability than GA and decreases opioid use, hence minimising opioid-related respiratory depression, which is a big issue in these patients. Despite these merits, SSA has some drawbacks. The block's duration may be inadequate for extended procedures, requiring supplementation by other analgesic techniques. Block spread variation may lead to insufficient or patchy analgesia and necessitate intraoperative intervention [5,6].

SSA is not without risk. Minor complications such as mild hypotension, bradycardia, nausea, vomiting, shivering, itching, transient hearing impairment, and urinary retention are common. There is also a moderate incidence of post-dural puncture headache and failed spinal block. More serious but rare complications include direct needle trauma, infection (e.g., meningitis or abscess), vertebral canal haematoma, spinal cord ischaemia, arachnoiditis, cauda equina syndrome, and neurological injury, potentially due to prolonged hypotension or vascular compromise [6,7].

The PQLB extends analgesia beyond the spinal blockade by targeting the thoracolumbar fascia and quadratus lumborum muscle, effectively covering the abdominal wall. Using ultrasound guidance enhances the precision of needle placement, thereby ensuring optimal distribution of local anaesthetic and improving block efficacy. This technique provides additional analgesic coverage, which is particularly beneficial in laparoscopic procedures involving extensive peritoneal irritation and visceral pain. Beyond enhancing analgesia, the PQLB plays a crucial role in opioid-sparing strategies, reducing the need for systemic opioids and their associated respiratory complications. This is particularly beneficial in bronchiectasis patients, as it helps avoid opioid-induced respiratory depression, hypoventilation, and mucus retention. PQLB has certain limitations. Successful execution requires specialised skills and access to ultrasound equipment, which may not be universally available. Additionally, there is still the possibility of block failure or inadequate analgesia, for which contingency plans would be needed to provide supplemental analgesia [8,9].

Possible complications of PQLB include hypotension, possibly due to local anaesthetic spread into paravertebral spaces, and the risk of local anaesthetic systemic toxicity, particularly when large volumes are used. Other technical risks include injury to surrounding structures such as the pleura, kidney, retroperitoneal vessels, or nerve roots, especially if anatomical visualisation is suboptimal. Unwanted blockade of parts of the lumbar plexus may lead to lower limb weakness and delayed ambulation [9,10].

[Table/Fig-2] summarises reported cases and studies highlighting regional anaesthesia approaches to minimise pulmonary risks while providing adequate analgesia in bronchiectasis patients [4,11-14].

Study	Case presentation	Anaesthesia technique used	Takeaways
Current case	43-year-old female with bronchiectasis undergoing laparoscopic cholecystectomy	SSA combined with PQLB	Provided adequate surgical anaesthesia and prolonged postoperative analgesia while avoiding General Anaesthesia (GA) -related pulmonary risks
Mahatme K et al., [11]	68-year-old female with bronchiectasis undergoing radical mastectomy	SSA	Early respiratory distress and hoarseness were managed successfully. Highlights the importance of patient safety and monitoring for intrathecal adjuvant side effects during SSA
Rajan S et al., [12]	33-year-old transgender female with extensive bronchiectasis undergoing bilateral breast augmentation	SSA	Provided a localised dense block with hemodynamic stability; avoided risks of GA; uneventful recovery; supports SSA as a safe alternative in high-risk bronchiectasis patients
Rao CA et al., [4]	59-year-old female with bronchiectasis and ductal carcinoma of the breast undergoing mastectomy with axillary dissection	SSA supplemented with ultrasound-guided axillary block	Avoided GA risks in cardiopulmonary compromised patient; effective sensory block (T1-T7) with sparing of C8; successful multimodal regional anaesthesia strategy with uneventful intra- and postoperative course
Ökmen K et al., [13]	Prospective, double-blind, randomised controlled trial including 60 patients undergoing laparoscopic cholecystectomy	Bilateral ultrasound-guided PQLB with Patient-Controlled Analgesia (PCA)	PQLB significantly reduced postoperative pain scores and tramadol consumption without increasing sedation or side effects, supporting QLB as an effective analgesic technique after laparoscopic cholecystectomy
Omran AS et al., [14]	Randomised controlled trial including 30 patients undergoing laparoscopic bariatric surgeries	Bilateral PQLB	Reduced intra- and postoperative pain and opioid requirements, lowered intraoperative heart rate and blood pressure, decreased nausea and vomiting, and facilitated early ambulation

[Table/Fig-2]: Summary of anaesthesia techniques and outcomes in bronchiectasis patients undergoing surgery [4,11-14].

CONCLUSION(S)

The successful anaesthetic management of a patient with bronchiectasis undergoing laparoscopic cholecystectomy further emphasises the benefits of a well-crafted regional anaesthesia strategy. The use of SSA ensured good surgical conditions at the same time while preserving spontaneous respiration, which decreased the risks such as respiratory depression, bronchospasm, and postoperative pulmonary complications associated with GA. Adding PQLB did enhance postoperative analgesia, reduce the opioid requirements and further support the respiratory function. This case highlights the individualised planning within anaesthetics for a patient with pulmonary compromise, pointing to the fact that a successful regional technique performed can improve both the perioperative and recovery outcomes at the expense of fewer systemic complications.

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