



Original Article


Thoracic Segmental Spinal Anaesthesia for Laparoscopic Cholecystectomy in Patients with Moderate to Severe Chronic Obstructive Pulmonary Disease

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ABSTRACT

Patients with chronic obstructive pulmonary disease (COPD) undergoing laparoscopic cholecystectomy face increased risk of postoperative pulmonary complications under general anaesthesia (GA). Thoracic segmental spinal anaesthesia (TSSA) has emerged as an effective alternative in such patients. This prospective observational study included thirty-five patients with moderate to severe COPD scheduled for laparoscopic cholecystectomy. TSSA was successfully administered in thirty-four cases (97.1%), while one patient required conversion to GA due to prolonged surgery. Haemodynamic stability was maintained throughout, and no major respiratory events occurred. Shoulder tip pain was the most frequent postoperative complaint, mild in nature and managed with analgesics. TSSA proved to be a safe, feasible, and well-tolerated anaesthetic option for laparoscopic cholecystectomy in COPD patients, providing stable haemodynamics and minimal postoperative respiratory compromise.

Keywords: *Chronic obstructive pulmonary disease (COPD) Laparoscopic cholecystectomy Ropivacaine Spinal anaesthesia.*

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) increases perioperative morbidity, especially in patients undergoing abdominal surgery under general anaesthesia (GA). Airway instrumentation and positive pressure ventilation can impair pulmonary function, leading to complications such as atelectasis, bronchospasm, and respiratory failure, particularly in moderate to severe COPD.

Laparoscopic cholecystectomy is typically performed under GA; however, pneumoperitoneum further reduces lung compliance and can worsen respiratory function in these patients. Thoracic segmental spinal anaesthesia (TSSA) has emerged as an alternative, avoiding airway manipulation while preserving spontaneous respiration, ensuring stable haemodynamics, and promoting early recovery.

Despite its feasibility, evidence on the use of low-dose local anaesthetics, particularly 0.5% ropivacaine, remains limited. This study evaluates the safety and efficacy of TSSA using low-dose ropivacaine in patients with moderate to severe COPD undergoing laparoscopic cholecystectomy.

Aims

To evaluate the safety and efficacy of Thoracic Segmental Spinal Anaesthesia in Laparoscopic Cholecystectomy in COPD Patients.

PATIENTS AND METHODS

This prospective observational study was carried out in the Department of Anaesthesiology, GMC and Associated Hospitals, Srinagar, after institutional ethics committee approval and written informed consent. Thirty-five adult patients aged 45–70 years, classified as ASA III with moderate to severe COPD, were included.

Inclusion criteria:

- Elective laparoscopic cholecystectomy
- Diagnosed moderate to severe COPD
- ASA physical status III

Exclusion criteria:

- Severe cardiac disease
- Coagulopathy or spinal deformity
- Local infection at puncture site
- Allergy to local anaesthetics
- Patient refusal

All patients were preloaded with 10 ml/kg Ringer's lactate and premedicated with intravenous midazolam (1 mg) and glycopyrrolate (0.2 mg). Under aseptic precautions, TSSA was performed at the T8–T9 interspace using a 26-gauge Quincke needle. After confirming free cerebrospinal fluid flow, 1.5–2.0 ml of 0.5 % ropivacaine (Isobaric) with 25 µg fentanyl was administered.

The target sensory level was T4–T10. Standard monitoring (ECG, NIBP, SpO₂, EtCO₂) was applied. Oxygen (2 L/min via nasal prongs) was given. Haemodynamics were recorded at baseline, then every 5 min intra-operatively. Hypotension (> 20 % fall in MAP) was managed with fluids and ephedrine; bradycardia (< 50 bpm) with atropine. Post-operative parameters included pain, nausea, vomiting, shoulder discomfort, and respiratory complications.

RESULTS

Thirty-five patients were studied. Laparoscopic cholecystectomy was completed under TSSA in thirty-four patients (97.1 %). One patient required conversion to GA due to prolonged surgery.

Intra-operative haemodynamics remained stable. Four patients (11.4 %) developed mild hypotension and two (5.7 %) had bradycardia; all responded to standard treatment. Shoulder-tip pain was seen in five patients (14.2 %) and was the most common postoperative complaint. No episodes of desaturation, respiratory distress, or neurological sequelae were reported.

Parameter	Observation
Total patients	35
Completed under TSSA	34 (97.1 %)
Converted to GA	1 (2.9 %)
Hypotension	4 (11.4 %) – managed with fluids/ ephedrine
Bradycardia	2 (5.7 %) – treated with atropine
Shoulder-tip pain	5 (14.2 %) – mild, most common post-operative complaint managed with Fentanyl 25 mcg incremental dose
Desaturation	None
Post-operative pulmonary complications	None

All patients maintained SpO₂ > 96 % throughout. Early ambulation within 4 hours and oral intake within 6 hours were achieved by most patients. No post-operative pulmonary or neurological complications were noted. These findings mirror those reported by Imbelloni et al. [1] and Van Zundert et al. [2].

DISCUSSION

Thoracic segmental spinal anaesthesia has gained increasing acceptance as a feasible alternative to general anaesthesia for laparoscopic cholecystectomy, particularly in high-risk COPD patients. By avoiding tracheal intubation and mechanical ventilation, TSSA helps preserve pulmonary mechanics and prevents post-operative respiratory compromise [3, 6].

In this study, 97 % of surgeries were completed successfully under TSSA alone, comparable to previous work [1, 2, 5]. Minor haemodynamic changes were easily managed, consistent with Gurudatta et al. [5]. Shoulder-tip pain, resulting from diaphragmatic irritation due to pneumoperitoneum, was mild and controlled with intravenous analgesics [4].

No desaturation or respiratory distress was recorded, supporting Bevan's conclusion [3] that regional anaesthesia preserves respiratory function in COPD. Kahveci et al. [7] and Al-Dohayan et al. [9] similarly documented excellent patient comfort and safety using low-dose thoracic spinal blocks.

TSSA allows targeted segmental blockade with minimal cephalad spread, maintaining diaphragmatic motion and early recovery [8]. Given these benefits, TSSA is a rational and safe choice for patients in whom GA poses increased pulmonary risk [9, 10].

CONCLUSION

Our study is distinct because it evaluates thoracic segmental spinal anaesthesia for laparoscopic cholecystectomy in COPD patients using 0.5% ropivacaine, whereas the commonly used standard concentration in previous studies has been 0.75% ropivacaine. By using a lower concentration, our study aims to determine whether effective anaesthesia, stable haemodynamics, preservation of respiratory function, and faster recovery can still be achieved with potentially fewer drug-related effects. This difference makes our study important in exploring a safer and equally effective alternative for appropriately selected high-risk patients.

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