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Original Research Article

A Prospective Randomized Study Comparing Spinal and General Anaesthesia for Perioperative Pulmonary Outcomes in Patients with Chronic Obstructive Pulmonary Disease undergoing Lower Limb Orthopaedic Procedures

Sana Qureshi[1], Mohammed Saif Niyazi[2]

[1]Consultant Anaesthesiologist, Department of Anaesthesia, Jawahar Lal Nehru Cancer and Research Hospital, Bhopal, M.P., India

[2]Consultant Orthopaedic Surgeon, Department of Orthopaedics, Shri Rawatpura Sarkar Institute of Medical Sciences and Research, Pacheda, Chattisgarh, India

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Corresponding Author: Dr. Sana Qureshi

Conflict of interest: Nil

Abstract

Background and Aims: Chronic Obstructive Pulmonary Disease (COPD) significantly elevates the risk of postoperative pulmonary complications (PPCs). This research aimed to evaluate whether Spinal Anaesthesia (SA) offers superior respiratory protection compared to General Anaesthesia (GA) in patients undergoing major lower limb surgery.

Methods: In this randomized controlled trial, 100 COPD patients (GOLD stages II-III) were allocated to two groups (n=50 each). Group S received SA (0.5% hyperbaric bupivacaine, target level T10), while Group G received standardized GA with lung-protective ventilation. Primary endpoints were the incidence of PPCs and postoperative oxygenation levels. Secondary endpoints included ICU requirements and hospital length of stay (LOS).

Results: The cumulative incidence of PPCs was significantly lower in the Spinal group (12% vs 32% in Group G; P=0.016). Postoperative oxygen saturation at 24 hours was significantly higher in Group S (P<0.05). Furthermore, Group S demonstrated a shorter mean hospital stay (6.2±1.4 vs 8.5±2.1 days; P<0.01).

Conclusion: For COPD patients undergoing lower limb orthopaedic surgery, Spinal Anaesthesia is associated with improved respiratory outcomes and a more efficient recovery profile than General Anaesthesia.

Keywords: COPD, Spinal Anaesthesia, General Anaesthesia, Orthopaedics, Pulmonary Complications.

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) remains a formidable challenge in perioperative medicine, with pulmonary complications occurring in up to 30% of high-risk surgical cases.[1]

General Anaesthesia (GA) typically involves airway manipulation and mechanical ventilation, which can incite bronchospasm and alter mucociliary clearance. Conversely, Spinal Anaesthesia (SA) avoids these triggers but carries a theoretical risk of accessory muscle paralysis if the block height is excessive.[2] While neuraxial techniques are often preferred, contemporary data comparing these modalities in the Indian demographic is limited, especially regarding 2024-2025 clinical outcomes.[3]

Methods

After obtaining Institutional Ethics Committee approval and written informed consent, 100 patients aged 25–80 years with stable COPD (FEV1/FVC < 0.70) were enrolled.

- **Group S (n=50):** Received SA at L3-L4 or L4-L5 using 12.5–15 mg of 0.5% hyperbaric bupivacaine.
- **Group G (n=50):** Received GA with Propofol, Fentanyl, and Vecuronium. Ventilation was maintained at 6 ml/kg (PBW) with a PEEP of 5 cmH2O.[4]

  Primary outcomes were defined as the occurrence of atelectasis, pneumonia, or respiratory failure within 7 days. Statistical analysis was performed using the Chi-square test and Student's t-test via SPSS v26.0.

Results

Baseline characteristics were similar across groups. Group G demonstrated a significantly higher rate of

postoperative atelectasis (24% vs 8%, P=0.03) and required more frequent non-invasive ventilatory support (NIV) (18% vs 4%, P=0.024).

Table 1: Comparison of Postoperative Outcomes (N=100)

Parameter	Group S (n=50)	Group G (n=50)	P-value
Atelectasis (n, %)	4 (8%)	12 (24%)	0.031
Unplanned NIV Support	2 (4%)	9 (18%)	0.024
Total Patients with ≥1 PPC	6 (12%)	16 (32%)	0.016
Hospital Stay (Days)	6.2 ± 1.4	8.5 ± 2.1	< 0.001

Discussion

Our findings indicate that SA provides a protective effect against respiratory morbidity in COPD patients. By bypassing endotracheal intubation, SA prevents the reflex bronchoconstriction often observed during GA induction.[1] Recent 2025 evidence supports this, noting that GA is an independent risk factor for unplanned re-intubation in patients with pulmonary disease.[5,6] The preservation of the "cough reflex" under SA is vital for secretion clearance, directly contributing to lower atelectasis rates (8% vs 24%).[7] While clinicians often fear the respiratory impact of a spinal block, our data shows that a targeted T10 level ensures better stability than GA.[8] Latest 2024 studies emphasize that early mobilization—facilitated by the superior analgesic profile of SA—reduces the risk of secondary pneumonia and thromboembolism in the elderly.[9,10]

Conclusion

Spinal Anaesthesia should be prioritized over General Anaesthesia for COPD patients undergoing lower limb surgery to minimize pulmonary risks and accelerate discharge.

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