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Perioperative Silent Lung: A Systematic Review of 37 Cases With Cell-Type-Resolved Mechanistic Annotation

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ADMINISTRATIVE INFORMATION

Support - No support.

Review stage at the time of initial registration - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 23 November 2026 and was last updated on 23 November 2026.

INTRODUCTION

Review question / Objective What are the clinical features, triggering agents, timing, management, and outcomes of perioperative silent lung (severe refractory bronchospasm with near-absent ventilation) in published case reports, and which lung and airway cell types do the implicated agents target at single-cell resolution?

Rationale Perioperative silent lung is a rare but potentially fatal airway crisis. Evidence consists almost entirely of scattered case reports, and no systematic registry exists. The triggering agents span anesthetics, muscle relaxants, colloids, opioids, and others, but their cellular effectors in the lung and airway are undefined. This review systematically assembles all published cases and annotates the implicated agents at cell-type resolution using public single-cell, drug-perturbation, and genetic datasets, to generate testable mechanistic hypotheses for prevention and management.

Condition being studied Perioperative silent lung (severe, refractory bronchospasm with near-absent breath sounds or ventilation during anesthesia and the perioperative period).

METHODS

Participant or population Patients of any age undergoing anesthesia, surgery, or perioperative procedures who developed perioperative silent lung (severe, refractory bronchospasm with near-absent breath sounds or ventilation).

Intervention Perioperative exposure to a suspected triggering agent (anesthetics, muscle relaxants, colloids, opioids, antibiotics, or other perioperative drugs/substances) preceding the onset of silent lung.

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Comparator Not applicable. This is a systematic review of published case reports and case series without a comparator group; all analyses are descriptive.

Study designs to be included Published case reports and case series with extractable patient-level data. Reviews, editorials, animal-only studies, and conference abstracts without case data are excluded.

Eligibility criteria Population: patients of any age undergoing anesthesia, surgery, or perioperative procedures. Condition: perioperative silent lung / severe refractory bronchospasm with near-absent breath sounds or ventilation. Report types: published case reports and case series with extractable patient-level data. Exclusion: reviews, editorials, animal-only studies, conference abstracts without case data, reports without a perioperative context or without a compatible clinical description. Language: no language restriction; non-English records assessed from English titles and abstracts.

Information sources PubMed (MEDLINE), searched from inception through November 2026. Reference lists of included articles were screened. Single database by design; acknowledged as a limitation.

Main outcome(s) Primary: distribution of triggering agents and trigger layers (case-level proportions with Wilson score 95% CIs); timing of onset; remission rate. Secondary: cell-type-resolved annotation of triggering agents using three public-data rulers (drug-target receptor expression in the Human Lung Cell Atlas; L1000 perturbation signatures; mechanical-ventilation response in GSE274828) and genetic evidence from the GWAS Catalog.

Quality assessment / Risk of bias analysis Formal risk-of-bias tools are not applicable to single case reports; reporting bias and the hypothesis-generating nature of case-report evidence are addressed qualitatively in the limitations.

Strategy of data synthesis Descriptive synthesis only (no meta-analysis): case-level proportions with Wilson score 95% confidence intervals, layer-based grouping, and forest plots. Mechanistic annotation is a computational overlay on public datasets and is reported separately from the clinical synthesis.

Subgroup analysis Cases are grouped by a predefined three-layer trigger classification (core trigger / allergic-layer trigger / differential-control cases) and by timing of onset (induction, maintenance, emergence/recovery).

Sensitivity analysis For the mechanistic annotation, a pseudobulk sensitivity analysis of the mechanical-ventilation dataset (GSE274828) was performed by aggregating single-cell profiles to sample level before differential expression testing, to confirm the robustness of cell-level findings.

Country(ies) involved China.

Keywords perioperative; silent lung; bronchospasm; single-cell; anesthetics; systematic review.

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