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Using lung ultrasound to compare different breathingsupport settings during surgery to see which one best prevents lung collapse afterward

Submission date
05/02/2026

Recruitment status
No longer recruiting

Registration date
06/02/2026

Overall study status
Completed

Last Edited
06/02/2026

Condition category
Surgery

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol
Background and study aims
When people are under general anaesthetic, parts of the lungs can sometimes collapse. This is called atelectasis, and it can make breathing harder after surgery. This study looked at whether different ways of supporting the lungs during an operation could help prevent this problem. The researchers compared two levels of pressure used to briefly “reexpand” the lungs, and two levels of pressure used to keep the lungs open afterwards. They used lung ultrasound scans to see which approach worked best.

Who can participate?
Adults aged 18 or older who were healthy enough for surgery and scheduled to have a thoracoscopic bilateral sympathectomy (a keyhole chest operation) could take part. People with lung disease, previous chest surgery, or abnormal scans before surgery were not included.

What does the study involve?
Participants were randomly placed into one of four groups. Each group received a different combination of lung pressures during their operation. These pressures were applied by the anaesthetist and did not require any extra procedures. After each part of the surgery, the anaesthetist carried out a short manoeuvre to help reopen the lungs. A lung ultrasound scan was then done about 30 minutes later to check how well the lungs were working. Routine breathing tests, blood tests and checks for symptoms such as chest tightness were also carried out.

What are the possible benefits and risks of participating?
There was no guaranteed personal benefit, but the information gained may help improve breathing care during surgery in the future. The risks were low and similar to those of standard anaesthesia. The pressures used are commonly applied in operating theatres, and the ultrasound scan is safe and painless.

Where is the study run from?
The study was carried out at The First Affiliated Hospital of Fujian Medical University in Fuzhou, China.

When is the study starting and how long is it expected to run for?
The first participant joined the study in January 2022. Recruitment ended in December 2022, and the study was completed in April 2023.

Who is funding the study?
The study was initiated and funded by the research team at The First Affiliated Hospital of Fujian Medical University.

Who is the main contact?
The main contact is Dr Xianzhong Lin from the Department of Anesthesiology at The First Affiliated Hospital of Fujian Medical University, 18350444834@163.com

Contact information

Type(s)
Public, Scientific, Principal investigator

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Study information

Scientific Title
Effect of different on postoperative respiratory outcomes and lung aeration, in patients undergoing thoracoscopic sympathectomy: a randomized controlled trial

Study objectives
To evaluate the effectiveness of different lung recruitment maneuver (RM) pressures (Ppeak 30 vs 40 cmH_2O) combined with different levels of positive end-expiratory pressure (PEEP 0 vs 8 cmH_2O) in reducing postoperative atelectasis and improving lung aeration/respiratory outcomes, assessed by lung ultrasound (LUS), in adult patients undergoing elective thoracoscopic bilateral sympathectomy.

Ethics approval required
Ethics approval required

Ethics approval(s)
approved 23/12/2021, Branch for Medical Research and Clinical Technology Application, Ethics Committee of the First Affiliated Hospital of Fujian Medical University (NO.20 Chazhong Road, Fuzhou, Fujian, 350005, China; +86 591-87981028; 1518504602@qq.com), ref: MRCTA,ECFAH of FMU 20211482

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Blinded (masking used)

Control
Active

Assignment
Factorial

Purpose
Prevention, Treatment

Study type(s)

Health condition(s) or problem(s) studied
Postoperative atelectasis and lung aeration impairment under general anesthesia in patients undergoing elective thoracoscopic bilateral sympathectomy.

Interventions
This was a prospective, randomized, assessor-blinded, 2×2 factorial trial. Adult patients undergoing elective thoracoscopic bilateral sympathectomy were randomized into four parallel groups according to recruitment maneuver peak airway pressure (Ppeak 30 vs 40 cmH_2O) and PEEP (0 vs 8 cmH_2O): A (30/0), B (40/0), C (30/8), and D (40/8). Immediately after right-sided sympathectomy, a manual recruitment maneuver was performed by adjusting the adjustable pressure-limiting valve to the assigned Ppeak (30 or 40 cmH_2O) and sustaining it for 15 seconds once the target pressure was reached; the same maneuver was repeated after the left-sided procedure. Subsequently, the assigned PEEP (0 or 8 cmH_2O) was applied and ventilation was switched to SIMV until extubation. Lung ultrasound examinations were performed by a trained anesthesiologist blinded to group allocation using a standardized 12-region scanning protocol.

Randomisation process
Participants were randomised using block randomisation with a 1:1:1:1 allocation ratio to the four parallel groups. The randomisation sequence was generated in advance using randomization.com. The sequence was printed and placed into sequentially numbered, opaque, sealed envelopes to ensure allocation concealment. A nurse who was not involved in outcome assessment distributed the envelopes in numerical order. After a participant was enrolled and baseline assessment was completed, the next envelope in sequence was opened to reveal the assigned group. The lung ultrasound outcome assessor was blinded to group allocation.

Intervention Type
Procedure/Surgery

Primary outcome(s)
1. Total lung ultrasound (LUS) score measured using standardized 12-region LUS scoring system: each region scored 0–3 (0 normal aeration with <3 B-lines; 1 ≥3 well-spaced B-lines; 2 coalescent B-lines; 3 lung consolidation). Total score is the sum across 12 regions (range 0–36); higher scores indicate greater impairment of lung aeration at 30 minutes after the final recruitment maneuver (T4; 30-min post-RM)

2. Incidence of atelectasis, defined as an LUS score ≥2 in any of the 12 regions (binary outcome: yes/no) measured using lung ultrasound score (LUS) at 30 minutes after the final recruitment maneuver (T4; 30-min post-RM).

Key secondary outcome(s))
1. Heart rate and blood pressure measured using routine monitoring at T0 (pre-induction), T1 (post-intubation), T2 (post-RM), T3 (5-min post-RM), T4 (30-min post-RM)

2. Dynamic compliance and other ventilatory parameters measured using the anesthesia machine at T1–T4

3. Arterial blood gas and oxygenation measured using arterial blood gas analysis; PaO_2/FiO_2 ratio at T0, T3, T4

4. Postoperative chest tightness measured using presence/absence recorded at during PACU stay

Completion date
18/04/2023

Eligibility

Key inclusion criteria
1. Adults aged ≥18 years
2. ASA physical status I–II
3. BMI <28 kg/m²
4. Scheduled for elective thoracoscopic bilateral sympathectomy
5. No history of cardiothoracic surgery or pulmonary disease
6. Preoperative chest CT without significant abnormalities
7. Written informed consent provided

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 years

Upper age limit

100 years

Sex
All

Total final enrolment
121

Key exclusion criteria
1. Preoperative Visual Analogue Scale (VAS) score > 2
2. Failure to complete the lung ultrasound (LUS) examination / incomplete LUS dataset
3. Conversion to an alternative surgical approach
4. Withdrawal of consent (prior to randomisation)

Date of first enrolment
05/01/2022

Date of final enrolment
30/12/2022

Locations

Countries of recruitment
China

Study participating centre
The First Affiliated Hospital of Fujian Medical University
Department of Anesthesiology
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China

Sponsor information

Organisation
The First Affiliated Hospital of Fujian Medical University

Funder(s)

Funder type

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available