
# Effectiveness of General Anesthesia Bronchial Intubation Combined with Thoracic Paravertebral Nerve Block in Patients Operated for Tuberculous Empyema

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## Abstract

**Objective:** Exploring the specific utility of performing general anesthesia bronchial intubation combined with thoracic paravertebral nerve block in patients undergoing tuberculous empyema surgery. **Method:** 60 patients with tuberculous empyema who underwent surgical treatment were selected for analysis, the research period is from June 2022 to June 2023. Based on the randomized numerical table method, all patients were divided into a control group and an observation group, the control group (30 cases) received routine general anesthesia and bronchial intubation, the observation group (30 cases) received thoracic paravertebral nerve block anesthesia based on the control group. Compare the anesthesia effects and postoperative recovery (recovery time, spontaneous breathing recovery time, extubation time) between the two groups. Compare the stress indicators before and after surgery between the two groups, as well as the occurrence of postoperative adverse reactions. **Result:** The anesthesia effect of the observation group was better than that of the control group ($P<0.05$), the postoperative recovery time, spontaneous breathing recovery, and extubation time in the observation group were shorter than those in the control group ($P<0.05$); the stress indicators after surgery in both groups were improved compared to before surgery, but compared to the control group, the observation group was lower ($P<0.05$), the incidence of adverse reactions in the observation group was only 6.67%, lower than 23.33% in the control group ($P<0.05$). **Conclusion:** Based on the use of general anesthesia and bronchial intubation for patients undergoing surgery for tuberculous empyema, the addition of thoracic paravertebral nerve block anesthesia can enhance the overall anesthesia effect. This approach can facilitate the swift recovery of patients post-surgery and holds promising potential for widespread application.

## Keywords

Tuberculous empyema, Surgery, Thoracic paravertebral nerve block, General anesthesia, Tracheal intubation

## Introduction

Tuberculous empyema is a serious disease that usually requires surgical treatment [1]. However, surgical treatment has a certain impact on the patient's physical condition and postoperative recovery [2]. Therefore, selecting appropriate anesthesia methods is crucial for the success of surgical treatment and postoperative recovery of patients [3]. Bronchial intubation under general anesthesia is a common anesthesia method, which can ensure the safety and comfort of patients during the operation [4]. However, bronchial intubation under general anesthesia has a certain impact on the patient's respiratory system, which may increase the risk of postoperative complications. Thoracic paravertebral nerve block is a local anesthesia method that can effectively control pain in the surgical area [5]. It reduces postoperative pain and improves patient comfort by blocking nerve conduction. However, the application effect of thoracic paraspinal nerve block in tuberculous empyema surgery still needs further research and verification [6]. Therefore, the purpose of this study was to explore the effect of bronchial intubation under general anesthesia combined with thoracic paravertebral nerve block in patients undergoing tuberculous empyema surgery.

## 1. Materials and Methods

### 1.1 General Information

60 patients with tuberculous empyema who underwent surgical treatment in our hospital from June 2022 to June 2023 were selected as the analysis subjects and randomly divided into a control group (30 cases) and an observation group (30 cases). There were 17 males and 13 females in the control group, aged 23-56 years, with an average age of (43.24 ± 5.43) years; there were 16 males and 14 females in the observation group, aged 22-56 years, with an average age of (44.25 ± 5.66) years, there was no statistically significant difference in patient data between the two groups. The study was approved by the Medical Ethics Committee; all patients gave informed consent. Inclusion criteria: meeting the indication for tuberculous empyema surgery; stable pulmonary lesion; age: 18-60 years; unilateral lesion; ASA grade from I-III. Exclusion criteria: history of drug dependence; obvious symptoms of tuberculosis poisoning; abnormal liver and kidney function; endocrine disease; history of alcoholism; allergic constitution; abnormal coagulation function; incomplete clinical data.

### 1.2 Method

#### 1.2.1 Routine general anesthesia and bronchial intubation were performed in the control group

All patients were routinely fasting and drunk and received preoperative preparation such as connection monitor and open fluid access after home entry. Electrodes were placed on the forehead and eyebrow arch to connect the Narcotrend monitor of the German Schiller company for the depth of anesthesia monitoring. Patients underwent radial artery puncture under local anesthesia to monitor the mean arterial pressure. After oxygen inhalation to the patient, anesthesia was induced with midazolam injection (H10980025), sufentanil citrate injection (H20054172), and rocuronium injection (H20093186) at doses of 0.05 mg/kg, 0.5 μ g/kg and 0.8 mg/kg, respectively. Double-lumen bronchial intubation was performed, and after confirming the position of double-lumen bronchial through electronic bronchoscopy, respiratory rate, and tidal volume were maintained at 10 to 14 times/min and 6 to 8 mL/kg respectively for single lung ventilation. Propofol emulsion injection (H19990282) and remifentanil hydrochloride for injection (H20030197) were given in anesthesia maintenance, and the doses were 3-5 μ g/mL and 3-4 ng/mL in target-controlled infusion mode, respectively. All three groups used propofol with a starting concentration of 1.5 μ g/mL with a gradient of 0.3 μ g/mL. For the surgical suture, the anesthetic drugs were stopped. After the operation, the patient entered the post-anesthesia care unit, and the patient was extubated after recovering consciousness and spontaneous breathing.

#### 1.2.2 The observation group was subjected to thoracic paravertebral nerve block anesthesia based on the control group

The observation group performed thoracic nerve block anesthesia based on the control group; (1) patient preparation: placed the patient on the operating bed on the affected side; (2) positioning: the doctor cleaned the patient's chest with disinfectant and determined the thoracic position with ultrasound equipment; (3) local anesthesia: doctors injected local anesthetic on the back skin; (4) nerve block: select 0.75% ropivacaine hydrochloride injection, when the tip of the nerve block needle reached the target position to block related nerves and local areas; (5) Tracheal intubation: After the onset of nerve block, the doctor will perform general anesthesia and bronchial intubation [10-12] surgery.

### 1.3 Outcome measures

Observation indicators include: (1) Analysis of anesthesia effects between two groups of patients, classify the anesthesia effect into three levels: excellent good and bad, excellent: patients did not feel significant pain during examination; Good: The patient feels slight pain during the examination; Poor: The patient feels obvious pain during the examination; Effective rate=(excellent+good) number of cases/total number of cases × 100%; (2) Comparison of postoperative recovery, including recovery time, spontaneous breathing recovery time, and extubation time; Awakening time: refers to the time from the end of the surgery to the recovery of consciousness for the patient, usually, narcotic sobriety score (such as Aldrete score) is used to assess the degree of recovery of patients, common assessment indicators include state of consciousness, breathing, circulatory stability, activity ability, oxygenation, etc, according to the scores of these indicators, it can be determined when the patients fully recover; self-breathing recovery time: refers to the time from the end of surgery to the recovery of self-breathing for the patient, generally speaking, after surgery, patients will be connected to a ventilator to assist in breathing, and the restoration of autonomous breathing means that patients can maintain normal respiratory function on their own, this time can be determined by observing the patient's respiratory rate, depth, and oxygenation status; Extubation time: refers to the time from the end of the operation to the removal of the Tracheal intubation, generally speaking, the patient will be inserted into the tracheal intubation after the end of the operation to assist breathing, while extubation means that the patient's respiratory function has been fully recovered and no external assistance is needed, the determination of extubation time can be judged by observing the patient's breathing, oxygenation and evaluation indicators before extubation. (3) Analysis of stress indicators before and after surgery, including serum COR, AD, NE, Ang-II, (a) Enzyme-linked immunosorbent assay (ELISA): This method utilizes specific antibodies to bind to COR, AD, NE, Ang-II, and then produces color reactions through enzyme-labeled secondary antibodies to determine the concentration; (b) Radioimmunoassay (RIA): This method uses radioactive Isotopic labeling COR, AD, NE, Ang-IIto competitively combine with COR, AD, NE, Ang-II in the sample to determine its concentration; (c) High-performance liquid chromatography (HPLC): This is a commonly used method for separation and determination. It determines the concentration of these two substances through chromatographic separation of samples and detection by a detector, it determines the concentration of these two substances through chromatographic separation of samples and detection by a detector. (d) Compare the adverse reactions of two groups of patients, (1) Collect data: Collect information related to adverse reactions, including basic patient information, types and severity of adverse reactions, etc; (2) Determine time range: Determine the time range for statistics, usually in days, weeks, months, or years; (3) Calculate the number of adverse reactions: Count the number of adverse reactions that occur within a given time range; (4) Calculate the total number of patients: Count the total number of patients who have received treatment or observation within a given time frame; ⑤Calculate the incidence of adverse reactions: Divide the number of adverse reactions by the total number of patients, and then multiply by 100% to obtain the incidence of adverse reactions [13, 14].

### 1.4 Statistical processing

The SPSS 22.0 system was used for data analysis, with measurement data represented by ($\overline{x}$±*s*) and t-test performed, while counting data represented by (*n%*) and $\chi^2$-test performed, the significance level was set to $P$<0.01.

## 2. Result

### 2.1 Analysis of anesthesia effects in two groups of patients

The anesthesia effect of the observation group was better than that of the control group ($P$<0.05), as shown in Table 1.

**Table 1. Comparison of anesthesia effects between two groups of patients [*n* (%)]**

| Group | control group（30 cases） | Observation group（30 cases） |
|---|---|---|
| Excellent | 18 (60.00) | 24 (80.00) |
| Good | 6 (20.00) | 5 (16.67) |
| Poor | 6 (20.00) | 1 (3.33) |
| Effective rate (%) | 80.00 | 96.67* |

Note: Compared with the control group, **P*<0.05.

## 2.2 Analysis of anesthesia effects in two groups of patients

The postoperative recovery time, spontaneous breathing recovery, and extubation time of the observation group were shorter than those of the control group (*P*<0.05), as shown in Table 2.

**Table 2. Comparison of postoperative recovery between two groups of patients ($\bar{x}$±*s*)**

| Group | Control group (30 cases) | Observation group (30 cases) |
|---|---|---|
| Wake-up time(min) | 20.45±3.44 | 16.43±3.43* |
| Autonomous breathing recovery time（min） | 12.44±2.34 | 10.45±2.35* |
| Extubation time（min） | 6.75±1.67 | 5.56±1.05* |

Note: Compared with the control group, **P*<0.05.

## 2.3 Analysis of stress indicators before and after surgery in two groups of patients

The postoperative stress indicators of both groups were improved compared to before surgery, but compared to the control group, the observation group was lower (*P*<0.05), as shown in Table 3.

**Table 3. Comparison of stress indicators between two groups of patients before and after surgery ($\bar{x}$±*s*)**

| Group | | COR (ng/ml) | AD (ng/ml) | NE (ng/ml) | Ang-II (pg/ml) |
|---|---|---|---|---|---|
| Control group (30 cases) | A | 110.34±18.99 | 0.11±0.02 | 210.34±45.56 | 34.89±9.77 |
| | B | 230.45±34.33 | 0.33±0.05 | 313.45±56.76 | 66.56±10.34 |
| Observation group (30 cases) | A | 111.45±17.89 | 0.12±0.02 | 213.56±44.45 | 35.56±9.78 |
| | B | 211.34±21.56* | 0.21±0.02* | 289.67±46.76* | 55.56±10.34* |

Note: Compared with the control group, **P*<0.05; A represents preoperative; B represents postoperative

## 2.4 Comparison of adverse reactions between two groups of patients

The incidence of adverse reactions in the observation group was lower than that in the control group (*P*<0.05), as shown in Table 4.

**Table 4. Comparison of adverse reactions between two groups of patients [*n* (%)]**

| Group | Adverse reactions occur | No adverse reactions occurred |
|---|---|---|
| Control group (30 cases) | 2 (6.67) | 28 (93.33) |
| Observation group (30 cases) | 7 (23.33) | 23 (76.67) |
| $\chi^2$ | 12.345 | 11.564 |
| *P* | <0.05 | <0.05 |

## 3. Discussion

The application of general anesthesia bronchial intubation combined with thoracic paravertebral nerve block in patients with tuberculous empyema is a topic of great clinical significance [15]. Tuberculous empyema is a serious infectious disease, and surgical treatment is one of the common treatment methods [16]. Bronchial intubation under general anesthesia and thoracic paravertebral nerve block are two commonly used anesthesia techniques. Their application effects in tuberculous empyema surgery deserve attention and discussion.

This study included surgical patients with tuberculous empyema. The patients were divided into two groups, one group received general anesthesia bronchial intubation combined with thoracic paravertebral nerve block, and the other group received simple general anesthesia bronchial intubation. Compare the anesthesia effect, recovery time, spontaneous breathing recovery time, extubation time, stress indicators, and incidence of postoperative adverse reactions between the two groups of patients. The results showed that the anesthesia effect of the observation group was better than that of the control group ($P$<0.05), the postoperative recovery time, spontaneous breathing recovery, and extubation time in the observation group were shorter than those in the control group ($P$<0.05); the stress indicators after surgery in both groups were improved compared to before surgery, but compared to the control group, the observation group was lower ($P$<0.05); the incidence of adverse reactions in the observation group was only 6.67%, lower than 23.33% in the control group ($P$<0.05).

Bronchial intubation under general anesthesia is a common anesthesia method, which can provide a general anesthesia effect so that patients will not feel pain during the operation. A paravertebral nerve block is an anesthesia technique that achieves pain control by blocking nerve conduction. In the operation of tuberculous empyema, the combination of general anesthesia with bronchial intubation and thoracic paravertebral nerve block can comprehensively utilize the advantages of the two anesthesia methods to provide a better anesthesia effect. First of all, bronchial intubation under general anesthesia can make the patient completely lose consciousness, avoid pain stimulation during the operation, and provide a stable depth of anesthesia and muscle relaxation, which is conducive to the operation. At the same time, bronchial intubation under general anesthesia can maintain the patient's ventilation and oxygenation status, and reduce the risk of respiratory complications during and after surgery. Secondly, thoracic paravertebral nerve block can provide effective pain control. After surgery for tuberculous empyema, patients often experience postoperative pain, which affects recovery and recovery. A thoracic paravertebral nerve block can alleviate postoperative pain, improve patient comfort, and improve postoperative recovery quality by blocking the transmission of pain signals. Studies have shown that the application of general anesthesia bronchial intubation combined with thoracic paravertebral nerve block in the operation of tuberculous empyema is effective. Firstly, this combined application can shorten the patient's recovery time[17-18]. Bronchial intubation under general anesthesia can provide sufficient anesthetic effect so that patients can quickly wake up after surgery and reduce postoperative discomfort. Secondly, bronchial intubation under general anesthesia combined with thoracic paravertebral nerve block can shorten the recovery time of spontaneous breathing of patients. A thoracic paravertebral nerve block can alleviate postoperative pain, promote the patient's recovery of spontaneous breathing, and improve postoperative lung function. In addition, this combined application can also reduce changes in stress indicators and the occurrence of postoperative adverse reactions, which has a positive impact on the psychological and physiological status of patients [19, 20].

## 4. Conclusion

In conclusion, general anesthesia bronchial intubation combined with thoracic paravertebral nerve block may have a good application effect in patients with tuberculous empyema, but more research and practice are needed to verify its safety and effectiveness. In practical applications, comprehensive consideration and decision-making should be made based on specific circumstances.

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## References

[1] Salahuddin M, Sarkiss M, Sagar AS, et al. Ventilatory Strategy to Prevent Atelectasis During Bronchoscopy Under General Anesthesia: A Multicenter Randomized Controlled Trial (Ventilatory Strategy to Prevent Atelectasis -VESPA- Trial) [J]. Chest, 2022; 162(6):1393-1401.

[2] Alioke II, Anumenechi N, Edaigbini SA. Treatment Outcomes of Tuberculous and Non-tuberculous Empyema Thoracis [J]. J West Afr Coll Surg., 2020; 10(1):15-19.

[3] Liu Z, Cao S, Zhu C, et al. Application of Thoracoscopic Hybrid Surgery in the Treatment of Stage III Tuberculous Empyema [J]. Ann Thorac Cardiovasc Surg., 2015; 21(6):523-528.

[4] Nie Q, Tao LX, Tu SJ, et al. Treatment of chronic tuberculous empyema by intrapleural injection of anhydrous ethanol [J]. Respir Med Case Rep., 2018, 12; 26:35-38.

[5] Ahn HY, Cho JS, Kim YD, et al. Intrathoracic muscular transposition in chronic tuberculous empyema [J]. Thorac Cardiovasc Surg., 2013; 61(2):167-71.

[6] Gaszyńska E, Ratajczyk P, Wieczorek A, et al. Comparison of microaspiration around TaperGuard tube cuffs and standard tracheal tubes in obese patients subjected to surgery under general anesthesia [J]. Pol Przegl Chir., 2014; 86(3):107-110.

[7] Marraro GA. Selective bronchial intubation for one-lung ventilation and independent-lung ventilation in pediatric age: state of the art [J]. Zhongguo Dang Dai Er Ke Za Zhi, 2020; 22(6):543-554.

[8] Ramsingh D, Frank E, Haughton R, et al. Auscultation versus Point-of-care Ultrasound to Determine Endotracheal versus Bronchial Intubation: A Diagnostic Accuracy Study [J]. Anesthesiology, 2016;124(5):1012-1020.

[9] Lu YP, Hu Y, Shi GP, et al. Combined inflating lung and insufflating calf pulmonary surfactant under general anesthesia in the treatment of postoperative intractable atelectasis [J]. Zhonghua Yi Xue Za Zhi, 2013; 93(23):1838-40.

[10] Sun YL, Sun L, Li TK, et al. Application of different kinds of endotracheal intubation in the combined thoracoscopic and laparoscopic esophagectomy [J]. Zhonghua Yi Xue Za Zhi, 2021; 101(9):630-635.

[11] Natalini G, Fassini P, Seramondi V, et al. Remifentanil vs. fentanyl during interventional rigid bronchoscopy under general anaesthesia and spontaneous assisted ventilation [J]. Eur J Anaesthesiol., 1999; 16(9):605-609.

[12] Oyamaguchi A, Tachibana K, Takeuchi M, et al. Management of a child with Swyer-James syndrome who underwent flexible bronchoscopy under general anesthesia [J]. Masui, 2013; 62(5):596-599.

[13] Kawagoe I, Hayashida M, Suzuki K, et al. Anesthetic Management of Patients Undergoing Right Lung Surgery After Left Upper Lobectomy: Selection of Tubes for One-Lung Ventilation (OLV) and Oxygenation During OLV [J]. J Cardiothorac Vasc Anesth., 2016; 30(4):961-966.

[14] Niu XG, Liu KP, Ren XF, et al. Clinical application of high frequency jet ventilation in cryotherapy for tracheo-bronchial carcinoma via rigid bronchoscopy [J]. Zhonghua Yi Xue Za Zhi, 2018; 98(24):1941-1944.

[15] Zhang L, Zhao X, Li Q. Successful single-lung ventilation using a bronchial occluder for repair a large tracheoesophageal fistula: a case report [J]. Int J Clin Exp Med., 2015; 8(8):14454-14456.

[16] Douadi Y, Bentayeb H, Malinowski S, et al. Anaesthesia for bronchial echoendoscopy: Experience with the laryngeal mask [J]. Rev Mal Respir., 2010; 27(1):37-41.

[17] Akaishi M, Saito J, Toyooka K, et al. Airway Management for Partial Lung Lobectomy in a Patient with Subglottic Stenosis: A Case Report [J]. Masui, 2016; 65(11):1170-1172.

[18] Hidano G, Nagata O, Narushima M, et al. Transient increase of bispectral index in a patient with bronchoconstriction after endotracheal intubation [J]. Masui, 2004; 53(1):75-78.

[19] Wake M, Sanagawa Y, Okamoto Y. A case of anesthetic management for re-expansion pulmonary edema of the dependent lung saved by superimposed HFJV during one lung ventilation for the thoracoscopic operation associated with bilateral pneumothorax [J]. Masui, 2000; 49(6):643-645.

[20] Borland LM, Colligan J, Brandom BW. Frequency of anesthesia-related complications in children with Down syndrome under general anesthesia for noncardiac procedures [J]. Paediatr Anaesth, 2004; 14(9):733-738.