

# A comparative study of sevoflurane and desflurane in the recovery of older patients undergoing thoracoscopic lobectomy

Xuefeng Li<sup>1</sup>, Guifeng Liu<sup>2</sup>, Yunpengfei Li<sup>1</sup>, Huiying Li<sup>1</sup>, and Feng Liang<sup>1,a</sup>

<sup>1</sup>Department of Anesthesiology, China-Japan Union Hospital, Ji Lin University, Changchun, Jilin, China

<sup>2</sup>Department of Radiology, China-Japan Union Hospital, Ji Lin University, Changchun, Jilin, China

**Abstract.** Purpose :To compare various recovery quality of sevoflurane and desflurane in elderly patients underwent thoracoscopic lobectomy, and to provide a reliable basis for anesthesiologists to choose anesthesia maintaining drugs.Method :Sixty elderly patients undergoing thoracoscopic lobectomy were selected from October, 2015 to May, 2016, and were divided into two groups by random number table, namely, the group of Dofetilide (group D) 30 cases, and sevoflurane (group S) 30 cases.The time of spontaneous respiration, the time of eye opening, the time of extubation and the time of awakening were recorded respectively in two groups. The incidence of nausea, vomiting and restlessness were also recorded.Result:There is no statistical difference comparing data of two groups.The time of spontaneous respiration, the duration of spontaneous breathing, the time of conscious recovery, the time of extubation and the time of leaving the room were shorter in group D than in group S, the difference was statistically significant ( $P < 0.05$ ). (3) There were no significant differences in the incidence of adverse events between the two groups ( $P > 0.05$ ).Conclusion :Compared with sevoflurane, desflurane can reduce the extubation and awakening time, improve the quality of awakening and speed up the turnover of surgery, and it has certain clinical application advantage for thoracoscopic lobectomy in elderly patients.

## Introduction

With the development of society to the aging, more and more elderly people to face surgery problems. The elderly due to organ degeneration, heart, lung, brain and other important organs of reserve function reduced, poor tolerance to anesthetics. At the same time elderly patients with liver and kidney function decline, drug clearance cycle is extended accordingly.Therefore, the choice of anesthesia maintaining drugs in elderly patients anesthesia as the top priority. Recently,sevoflurane and desflurane as inhalation anesthesia drugs commonly used in general anesthesia, their quality of awakening after surgery is superior to traditional inhaled anesthetics. In this study, sevoflurane and desflurane used in elderly patients undergoing thoracoscopic lobectomy, compared the awakening time,extubation period and the incidences of adverse events.To provide a reasonable basis for the selection of maintaining inhalation drugs for the treatment of thoracoscopic lobectomy.

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<sup>a</sup> Corresponding author: 295253720@qq.com

## 1. Materials and methods

### 1.1 General Information

This study was approved by our hospital ethics committee, and patients signed an informed consent form. Sixty patients aged from 65 to 82 years old, 40 males and 20 females with ASA grade II-III were selected from October 2015 to May 2016 undergoing thoracoscopic lobectomy under general anesthesia. Thirty patients in the desflurane group (group D) and 30 patients in the sevoflurane group (group S) were randomized into two groups.

### 1.2 Methods

#### 1.2.1 anesthesia

30min before anesthesia, we give patients intramuscular injection of penehyclidine hydrochloride 0.01mg / kg. after patients entering the operation room, we routinely monitor their five-lead ECG, pulse oxygen saturation, BIS monitoring. Under local anesthesia we give patients radial artery puncture catheterization to monitor invasive arterial pressure. After opening the upper limb venous access, we infused lactate Ringer solution (infusion rate 5-7ml / kg · h). The patients underwent induction of anesthesia after oxygen for 5min, followed by intravenous injecting midazolam 0.03mg / kg, cisatracurium 0.3mg / kg, sufentanil 0.3mg / kg, propofol 1.2mg / Kg. After the patient's spontaneous breathing and consciousness disappearing, we administered oxygen to the patient and withdrew the nitrogen gas. After 3 minutes, the patients received double-chamber bronchial intubation (No. 35-39). After we completing intubation, we inflated the cuff and connected the endotracheal tube to the anesthesia machine. After adjusting the anesthesia machine to manual ventilation mode, we can see the continuous PetCO<sub>2</sub> waveform and patients with good chest flutter on both sides. We identified the location of the tube with a bronchoscope, placed a dental pad and fixed the tube. Ventilation mode: single-lung intermittent positive pressure ventilation, respiratory rate 14 beats / min, tidal volume 8-10ml / kg, Inspiratory vs expiratory 1: 2, PEEP 5mmHg, PetCO<sub>2</sub> maintained at 30-40mmHg. Patients continued inhaling sevoflurane 1.5% -3% or desflurane 4% -8%, we maintain anesthesia depth of 1.0-1.3MAC, while appropriately adjusted the depth of anesthesia according to BIS. Before surgery, we added sufentanil 5-10ug, and according to the actual situation in the additional cisatracurium 5ml / h to maintain muscle relaxation. At 15 min preoperatively, we reduced the sevoflurane and desflurane inhalation concentration according to the flow-decreasing method. At the end of the procedure, we stopped inhalation of the anesthetic and opened a large fresh gas flow (O<sub>2</sub> 5 L / min) to wash out the residual anesthetic. At the same time, in order to prevent residual effects of muscle relaxants, the two groups were given neostigmine 1mg and atropine 0.5mg antagonistic.

#### 1.2.2 Outcome Measurement

After surgery, we recorded the time of restoring spontaneous breathing, patients' eyes opening moment, removal of endotracheal tube and leaving the recovery room. At the same time, adverse events such as restlessness, nausea, vomiting, hypotension, hypertension, arrhythmia, airway spasm were recorded.

#### 1.2.3 Statistical Methods

All data using SPSS 22.0 statistical software for processing, measurement data using mean and standard deviation ( $\bar{X} \pm S$ ) to represent. And paired t test for data comparison between two groups,  $P < 0.05$  considered statistically significant.

## 2.Results

### 2.1 General information

Comparing gender, age, BMI index, ASA classification and operation time of the two groups,the difference was not statistically significant ( $P > 0.05$ ). Table1

**Table 1** Comparison of the general data of the two groups of patients (  $X \pm S$  )

	S Grope	D Grope
gender(M/F)	19/11	20/10
age	71.40±4.13	70.93±4.35
weight(kg)	67.62±7.33	68.13±7.45
ASA(II/III)	17/13	20/10
Operation time(min)	125.7±15.43	127.3±16.36

### 2.2 Comparison of the recovery time between two groups

The time of spontaneous breathing recovery , following the command of open eyes , extubation and leaving the recovery room of Desflurane group (D group) patients is shorter than sevoflurane group (S group), and  $P < 0.05$ , with statistical significance. Table 2.

**Table 2** Comparison of wake-up time between the two groups ( $X \pm S$ )

	S Group	D Group
Breathing recovery(min)	9.62±1.31	6.47±1.14
Open eyes time(min)	12.79±1.93	8.26±1.77
Extubation time(min)	16.57±2.61	11.63±1.85
Leaving recovery room(min)	36.73±4.69	29.18±4.02

### 2.3 The comparison of the incidence of adverse events between two groups

There was no significant difference in the incidence of adverse events between the two groups ( $P > 0.05$ ). Table 3

**Table 3** Comparison of the incidence of adverse events between the two groups(cases)

	S Group	D Group
hytertension	2	3
hypotension	1	1
arrhythmia	0	0
Nausea,vomiting	3	2
restlessness	5	3
Airway spasm	0	1

## 3.Discussion

For the elder there is a decline in the physiological reserve capacity and their function of important organs decreased.In the central nervous system these phenomena showed as average weight of the brain decreasing, neurons shrinking and the density reducing, reduction of cerebral blood flow, neurotransmitter and receptor,all these often lead to Waking up for a long time, poor quality of recovery, and sometimes even postoperative cognitive dysfunction <sup>[1]</sup>.At the same time, most elderly patients'liver and kidney function declining leads to drugs clearance cycle extending, but also exacerbated the wake-up time delay. Therefore, looking for anesthesia maintaining drugs is

particularly important, which can make people rapid recovery after surgery and lead less postoperative complications.

Thoracoscopic surgery has the advantages of short time, less trauma and quick recovery. Surgery often requires patients to wake up after surgery, after extubation, if the patient has a good spontaneous breathing, so as to reduce postoperative complications and can make patients early discharge<sup>[2]</sup>. Sevoflurane or desflurane is with these characteristics, is one of ideal thoracic surgery anesthetics.

Desflurane is a third-generation inhaled anesthetic with a blood / gas partition coefficient of 0.42 and a fat / blood partition coefficient of 27, whose coefficient is the smallest of existing anesthetics, and therefore it can be controlled well. Because of low tissue dissolution, desflurane can be excreted more quickly<sup>[3]</sup>. At the same time, desflurane almost has no metabolites, which is known as inhalation anesthetics which has the least biotransformation in human body. Its impact on liver and kidney function is making desflurane more suitable for elderly patients with anesthesia.

In this paper, we observed the effect of sevoflurane and desflurane on the recovery period of the elderly patients and found that the spontaneous respiration recovery time, the time to follow the command, the time to extubate the tracheal catheter and the time to leave the recovery room were shorter in sevoflurane group, and P values were less than 0.05, it is with statistical significance. There were no significant differences in postoperative adverse events between the two groups ( $P > 0.05$ ). The two groups of patients studied in this study had similar age, body mass index, ASA classification, similar induction regimen, depth of anesthesia, and additional medication during surgery. The duration of surgery was similar and the time of discontinuation of narcotics was the same. Thus the study can present the impact of desflurane and sevoflurane on elderly patients' anesthesia recovery period objectively and correctly. Makey<sup>[4]</sup> and the other confirmed, comparing with sevoflurane, desflurane was used for anesthesia, and the patients can more rapidly recover after surgery, and their airway preventably reflexed faster, tracheal intubation was removed for a shorter time. Dexter<sup>[5]</sup> and others' meta-analysis results also show that extubation time reduced by 20% -25% in the patients who was used desflurane for anesthesia than sevoflurane. Similarly, in a recent meta-analysis, Agoliati et al.<sup>[6]</sup> demonstrated a significant advantage of desflurane in rapid extubation and reduction in wake-up delay comparing with sevoflurane. The study found that the patients who was used of desflurane for anesthesia less an average of 34% extubation time, the number of extubation delay also reduced by 95% -97%. In addition, Heavner<sup>[7]</sup> through the study found that when desflurane or sevoflurane was for older patients who undergo surgery for more than 2 hours, the patient that was used desflurane their time of eyes-open, following the command to handshake, extubation and orientation to restore was significantly better than sevoflurane group.

In thoracic surgery, one-lung ventilation may lead to alveolar damage of the ventilated lungs, this leads to pulmonary inflammatory responses that leading to lung injury. In contrast to total intravenous anesthesia, the use of sevoflurane or desflurane inhalation anesthetic can inhibit the release of inflammatory mediators in local cells, reduce the role of inflammatory factors, thereby reducing the inflammation of the ventilation lung. Modolo<sup>[8]</sup> and others summed up 20 comparative studies about anesthesia and inhalation anesthesia for single lung ventilation, then achieved a meta-analysis that pointed out there is no strong evidence making sure that anesthetic drugs will affect the prognosis of patients. Dupont<sup>[9]</sup> also reported that the impact of sevoflurane and desflurane on hemodynamics in patients with pulmonary surgery had no statistically significant difference, but desflurane group woke up faster and earlier.

HUA zhuming<sup>[10]</sup> found that the incidences of postoperative adverse events comparing sevoflurane and desflurane for elderly patients in the anesthesia through the study were not significant differences. Zhang et al found that compared with sevoflurane group, desflurane group in elderly patients had fewer postoperative complications. The two studies, as in this study, included fewer samples and the effect of sevoflurane and desflurane on the postoperative complications of elderly patients may require additional large, multicenter, randomized, controlled trials further validate.

## 4. Conclusion

Compared with sevoflurane, desflurane for elderly patients with thoracoscopic lobectomy can shorten the extubation and recovery time, improve the quality of recovery, speed up the turnover of surgery, it has certain clinical application advantages.

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