

## The Effectiveness of Butorphanol Infusion in Patients Undergoing Awake Fiberoptic Nasal Intubation

Tingju Hu<sup>1, a</sup>, Wenqian Li<sup>1</sup>, Junqing Li<sup>1</sup>, Chao Chen<sup>1</sup>, Xiaohua Zou<sup>1, b, \*</sup>

<sup>1</sup>Department of Anesthesiology, Affiliated Hospital of Guizhou Medical University, Guiyang Guizhou 550004, China.

<sup>a</sup>361818952@qq.com, <sup>b</sup>562931613@qq.com

### Abstract

**Objective** To evaluate the efficacy of butorphanol infusion in difficult airway patients undergoing awake fiberoptic nasal intubation. **Method** Sixty patients with difficult airway in our hospital, ASA I or II, aged 18-70 years and weighing 48-80kg, were selected and randomly divided into two groups (n=30 each): butorphanol group (group B) and saline group (group N). The patients of the two groups entered the room and injected penthyclidine after established venous access. The two groups all injected dexmedetomidine and remifentanyl continually for 10min. Then gave several drops of ephedrine to the nasal cavity to systolic vascular and 2% lidocaine for pharynx and larynx topical anesthesia. Group B was intravenously injected with butorphanol 1mg 5min before intubation and group N was intravenously injected with 0.9% normal saline 5min before intubation. Hemodynamic changes were recorded. Ramsay score, reflection of tussis, patients' satisfaction and anesthesiologist's satisfaction were recorded. **Result** Compared with Group N the HR and MAP of Group B at T1 was statistically lower. The  $\Delta$ HR and  $\Delta$ MAP of the two groups was statistically significant lower, too. ( $P < 0.05$ ). There is no statistically significant difference between the two groups in SpO<sub>2</sub> at T0 and T1 ( $P > 0.05$ ). Ramsay score, intubation time, patients' satisfaction, anesthesiologist's satisfaction were statistically significant compared with group N ( $P < 0.05$ ). **Conclusion** Butorphanol can be effectively used in difficult airway patients through nasal intubation by bronchofiberscope, reduce the cardiovascular reflection and intubation time, improve patient's comfort and anesthesiologists' satisfaction. **Clinical Trials Registration:** The trial was registered prospectively at ChiCTR (ChiCTR2000 033607).

### Keywords

Butorphanol, Topical anesthesia; difficult airway, Bronchofiberscope, Awake endotracheal intubation.

## 1. INTRODUCTION

Takita K [1-4] et al. showed that endotracheal intubation could cause blood pressure and heart rate increased in patients. Awake endotracheal intubation, especially for patients with heart and lung diseases such as hypertension and diabetes, may lead to serious cardiovascular and cerebrovascular events, increase perioperative risks, and bring horrific feelings to patients. For patients with difficult airway, it is not only necessary for the operator to have excellent technique of intubation guided by fiberoptic bronchoscopy, but also to have sufficient depth of anesthesia while retaining the patient's spontaneous breathing. Studies [5] have found that dexmedetomidine and remifentanyl can effectively inhibit the cardiovascular response caused by awake endotracheal intubation, but there are few reports on the effect of butorphanol on fiberoptic guidance of awake endotracheal intubation. This study mainly observed the

effect of butorphanol injection in the patient with fibronchoscopic guidance of awake endotracheal intubation.

## 2. MATERIALS AND METHODS

This study has been approved by the ethics of Guizhou Medical University Affiliated Hospital Committee and patients signed informed consent. This trial was registered on the Chinese Clinical Trial Registry and the registration number is ChiCTR2000033607. A total of 60 patients with difficult airway who is undergoing for selected surgery were randomly divided into two groups (N =30): Butorphanol group (Group B) and normal saline group (Group N), ASA I-II, age 18-70y, weight 48-80kg, no nasal bone or skull base fractures, no abnormal coagulation function, and no intracranial hypertension.

SpO<sub>2</sub>, ECG, BP and HR were routinely monitored after the patient entered the room and established the peripheral venous access of the upper limb. Intravenous injection of penequinoline hydrochloride (Chengdu Lyster Pharmaceutical Co., LTD., lot number: 181207) 1mg, dexmedetomidine hydrochloride (Jiangsu Hengrui Pharmaceutical Co., LTD., lot number: 180903BP) 1 g/kg and continuous intravenous infusion of remifentanyl hydrochloride (Yichang Renfu Pharmaceutical Co., LTD., lot number:90A08041) 0.1 g·kg<sup>-1</sup>·min continuous intravenous infusion for 10min, 6mg ephedrine nasal drop, and 2% lidocaine injection (Shanghai pujan linzhou pharmaceutical co., LTD., batch number: 180412212) to spray the dorsal tongue, soft palate and throat. In group B, 1mg butorphanol was injected intravenously 10min before intubation, and in group N, 0.9% normal saline was injected intravenously. After successful intubation, the anesthesia machine was immediately put on mechanical ventilation, followed by intravenous injection of propofol 2mg/kg, sufentanil 0.3 g/kg, and rocuronium 0.3 mg/kg.

Bp, HR and SpO<sub>2</sub> were recorded before injection butorphanol (T0) and 1min after intubation (T1). Intubation time of the two groups was recorded. Ramsay score, intubation time, the occurrence of adverse reactions in the two groups, patients' satisfaction and anesthesiologist's satisfaction score.

SPSS statistical software was used for analysis, measurement data were expressed as mean standard deviation ( $\bar{x} \pm s$ ), count data were expressed as percentages, and chi-square test was used, intra-group comparisons used repeated measures analysis of variance, and inter-group comparisons used single-factor variance Analysis,  $P < 0.05$  indicates that the difference is statistically significant.

The table 1 shows the arrangement of rotary kiln with accessories. Kiln can be used as a rotary dryer to remove water and moisture content from solid substances by introducing hot gases into a drying chamber. Kiln shell should be structurally strong with non-conductor lining and designed to withstand high temperature and prevent the thermal losses of the kiln. Construction and position alignment of the kiln is very important for all the process. In thermal processing of residual materials with a various origin and predominantly for fire treatment of hazardous wastes rotary kiln are employed.

## 3. RESULTS

There was no statistically significant difference in general conditions between the two groups ( $P > 0.05$ ), there was no statistically significant difference in HR and MAP at T0 ( $P < 0.05$ ), and there was no statistically significant difference in SpO<sub>2</sub> at T0 ( $P > 0.05$ ). See table 1.

**Table 1.** Comparison of general conditions and HR, MAP and SpO<sub>2</sub> at T0 (n=30)

Group	gender	age	BMI	T0MAP	T0HR	T0SpO <sub>2</sub>
	male/female	(year,x ± s)	(kg/m <sup>2</sup> ,x ± s)	(mmHg,x ± s)	(pbm,x ± s)	(%,x ± s)
Group N	14/16	40.8±15.7	22.6±3.1	94±11	75±13	96±2
Group B	13/17	45.1±17.5	23.7±2.6	87±8*	68±10*	96±2
Compared with group N,*P<0.05						

There were statistically significant differences in HR and MAP at T1 between the two groups ( $P < 0.05$ ), and no statistically significant differences in SpO<sub>2</sub> ( $P > 0.05$ ). Two groups of patients  $\Delta$  HR,  $\Delta$  MAP difference was statistically significant ( $P < 0.05$ ); There were statistically significant differences in Ramsay score, intubation time, patient satisfaction score and anesthesiologist satisfaction score ( $P < 0.05$ ), as shown in Table 2.

**Table 2.** Comparison of two groups of T1 HR, MAP, SpO<sub>2</sub>,  $\Delta$  MAP,  $\Delta$  HR, Ramsay score, incidence of intubation time, choking cough, patients' satisfaction, anesthesiologist's satisfaction (n = 30)

group	T1 MAP	T1HR	$\Delta$ MAP	$\Delta$ HR	T1SpO <sub>2</sub>
	(mmHg,x ± s)	(pbm,x ± s)	(mmHg,x ± s)	(pbm,x ± s)	(%,x ± s)
Group N	102±11	82±14	7±5	7±11	96
Group B	85±8*	70±9*	-2±5*	2±7*	96
Compared with group N,*P<0.05					

group	Intubation time	caugh	Ramsay Score	patients' satisfaction	anesthesiologist's satisfaction
	(mmHg,x ± s)	Yes/no	(minute, x ± s)	(minute, x ± s)	(minute, x ± s)
Group N	5.7±2.6	4/26	2.2±.04	8.3±0.6	7.2±0.9
Group B	3.9±0.8*	2/28	2.6±0.5*	9.0±1.1*	8.7±0.9*
Compared with group N,*P<0.05					

#### 4. DISCUSSION AND CONCLUSION

With the increase of population in China, the number of surgical operations increases, and the number of patients with difficult airway increases, too. Taylor [6] et al. believed that fibronchoscope intubation is a reasonable and effective method for patients with difficult airway. Fiberoptic bronchoscopy guided intubation has high requirements for anesthesia patients, which should not only ensure sufficient anesthesia depth to avoid vomiting reflex during intubation, laryngopharyngeal injury, and severe cardiovascular reaction caused by endotracheal intubation stress, but also avoid respiratory depression in patients with deep anesthesia, resulting in oxygen entering difficulty by mask, leading to hypoxia and even serious consequences in patients. Tartaric acid butorphanol [7] primarily activates  $\kappa$ receptor, which has dual antagonistic effects on  $\mu$ receptor. Antagonistic receptor antagonists have been used in patients with  $\mu$ receptor agonists to reduce or eliminate respiratory inhibition side effects which caused by  $\mu$ receptor, as well as analgesic effect of  $\kappa$ receptor antagonists. Butorphanol [8-11] has been shown to inhibit the cardiovascular response to endotracheal intubation. This inhibition is the effect of the  $\kappa$  receptor [12-14]. Because of this effect on opioid receptors, butorphanol has a unique advantage in patients with difficult airway awake endotracheal intubation. Combined with the results of this study, SpO<sub>2</sub> at T0 and T1 showed no statistically significant difference, indicating that butorphanol did not affect patients' respiration can supply with good analgesic effect, rare respiratory depression occurs.

Results from this study have showed that the differences of basic HR and MAP between the groups were statistically significant. The difference of HR and MAP after intubation was statistically significant, experimental group is obviously lower than the control group. HR and MAP's change difference was statistically significant at T0 and T1 time, butorphanol group is lower than the normal saline group, which showed butorphanol has inhibitory effect to the circulation and inhibit endotracheal intubation cardiovascular reaction. This study showed that there were statistically significant differences between the two groups in terms of ramsay score, intubation time, patients' satisfaction score and anesthesiologist's satisfaction score, indicating that butorphanol has good sedative and analgesic effects and is used to guide awake endotracheal intubation with difficult airway bronchoscope in a short time, with high patients' satisfaction and anesthesiologist's satisfaction.

To sum up, butorphanol injection can be effectively and safely used to guide awake endotracheal intubation with fiberoptic bronchoscopy in difficult airway, improve patients' comfort and anesthesiologists' satisfaction.

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