Abstract. – OBJECTIVE: The study aims to present a 15-patient case series of tracheal extubation in the prone position after endoscopic retrograde cholangiopancreatography (ERCP) general anesthesia. 

PATIENTS AND METHODS: Fifteen inpatients who underwent elective ERCP in our hospital were prospectively enrolled, and a series of case studies were conducted with the prone extubation technique after general anesthesia. All patients underwent routine operation of tracheal intubation under general anesthesia. After the surgery, when the train-of-four ratio (TOFr) ≥0.9, bispectral index (BIS) ≥80, tidal volume ≥6 ml/kg and the required actions could be performed, the endotracheal catheter was removed after sufficient negative pressure suction of oral secretions. After the endotracheal catheter was removed, the patient autonomously turned to the transport bed with the assistance of medical staff and was then admitted to the post-anesthesia care unit (PACU) for further observation. When the patient awoke, he had regained orientation, and presented stable vital signs, no nausea and vomiting, and no other discomfort symptoms, he/she was able to leave PACU and returned to the ward with a Steward score of ≥5.

RESULTS: All 15 patients who underwent ERCP elective surgery were successfully extubated in the prone position after surgery. Transient hypoxemia with SpO₂ below 90% occurred in 2 of the 15 patients and returned to normal with oxygen mask administration. 7 patients had coughs and were without special treatment. Another 1 patient showed transient abnormal hemodynamic fluctuations after extubation, mean airway pressure (MAP) was higher than 20% of the baseline value, and hemodynamics was stable after drug treatment.

CONCLUSIONS: The prone extubation technique is feasible for ERCP general anesthesia patients. However, a larger sample size is needed to validate its safety and to verify whether there exist advantages of the extubation technique in a prone position over a supine position.

Key Words: Endoscopic retrograde cholangiopancreatography, Anesthesia, Prone position, Tracheal extubation.

Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is the prevailing option for cholelithiasis, with successful removal of the common bile duct by sphincterotomy and stone extraction in the majority of cases. The success rate and patient recovery are associated with multiple factors such as the patient's lifestyle, anesthesia and other factors1-3. During the resuscitation and extubation stage of ERCP surgery under general anesthesia, the quality of tracheal extubation is a key technical procedure that affects the safety and efficiency of the operation. However, patients under anesthesia in special surgical positions require more medical and nursing assistance due to the supine position and are prone to unexpected adverse events during position changes: lack of airway management (turning and accidental slipping of the tracheal tube), loss or lack of monitoring, as well as severe coughing due to airway irritation, hemodynamic fluctuations, even bronchospasm, aspiration, hypoxemia, prolonged resuscitation time, muscle or joint injuries, etc. Some studies4 have shown that patients undergoing general anesthesia in the prone position, when changing the patient to the supine position after the operation, often present excessive coughing due to the stimulation of the tracheal tube.
to the airway, which leads to a variety of complications. In addition, scholars4-8 have reported that for patients undergoing general anesthesia for lumbar spine surgery, the prone position extubation provides more comfortable emergence and recovery periods with less alteration of respiratory status and a favorable recovery vs. the traditional supine extubation. As per medical knowledge and related studies2, it seems reasonable to remove the tracheal tube in the prone position for ERCP patients since it is associated with (1) short recovery time; (2) low stress; (3) avoidance of loss of monitoring data; (4) ease of drainage of oropharynx secretions; (5) ease to turn over on their own after being awake. Therefore, for patients undergoing ERCP general anesthesia, can we also consider extubation in the prone position? We hypothesize that it is feasible to extubate the tube in the prone position after ERCP general anesthesia. In this study, 15 patients will be included in a series of case analyses to explore the feasibility of extubation in the prone position after intubation of general anesthesia ERCP.

Patients and Methods

We prospectively included 15 inpatients who underwent elective ERCP surgery in our hospital, and adopted the prone position extubation technique after the general anesthesia. Patients provided written informed consent, as well as informed consent for the publication of the images. This study was approved by the Institutional Ethics Committee of the Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine.

Inclusion Criteria and Exclusion Criteria

Inclusion criteria: patients with American Society of Anesthesiologists (ASA) grade I-III, age 18-60 years old, elective general anesthesia ERCP were eligible participants.

Exclusion criteria: patients with difficult airway (modified Mallampati grade ≥III), a history of difficult intubation, difficult intubation, obese (BMI ≥30 kg/m²), patients with heart block, chronic heart insufficiency, acute respiratory infection, chronic obstructive pulmonary disease were excluded from the study.

Procedures of Anesthesia

Preparations before induction of anesthesia: the patient was required to routinely fast for 6-8 hours and abstain from drinking for 2 to 4 hours before surgery. After entering the endoscopic intervention room, the patient was required to lay supine on the interventional operation bed, breathe, and inhale oxygen (3 L/min) spontaneously through the mask. Routine monitoring of vital signs such as non-invasive blood pressure (NIBP), pulse oxygen saturation (SpO₂), simulated lead electrocardiogram monitoring (ECG), depth of anesthesia monitoring (BIS), and muscle relaxation monitoring (TOF) were conducted. After establishing peripheral venous access, an indwelling intravenous needle was placed, connected to Sodium Acetate Ringer’s solution, and the venous patency was confirmed, and the sedative dexmedetomidine 0.5 μg/kg was injected intravenously (pumping time greater than ten minutes). Anesthesia induction was performed via 0.5 μg/kg Sufentanil+Atracurium 2 mg/kg+Propofol 1-2 mg/kg slow static push until the induction drug fully took effect, ie. the TOF is 0, and the BIS value is lower than 60. The tracheal intubation was performed under the laryngoscopy. The type of catheter (inner diameter) was 7.0 mm for males, 6.5 mm for females. After inserting the tracheal tube into a suitable depth (24 cm for males, 22 cm for females), the endoscopic mouth ring tooth pad was placed, and the tracheal tube was fixed with medical tape, the anesthesia machine was connected to control breathing (tidal volume 6-8 ml/kg, respiratory rate 12-14 times/minute). Subsequently, the anesthesiologist, endoscopist, endoscopy nurse, nursing assistant, and interventional radiologists jointly turned the patient from the supine position to prone on the interventional bed and then adjusted the patient’s prone position (modified prone position): the right leg knee joint was flexed, and the left leg was straightened naturally. The right arm was raised to the side of the head and lay flat, the left arm naturally hung down against the base of the thigh, and a chest pad was placed on the right side of the patient’s chest under the clavicle, and the head was placed on a thin pillow covered with a disposable treatment towel, then the patient was assisted in turning to one side at 45° (head facing the operator).

Intraoperative anesthesia maintenance medication: Propofol (TCI: 3 μg/ml), + remifentanil (TCI: 2 ng/ml) continuous pump injection, continuous monitoring of vital signs and TOF, BIS values during the operation were detected. When anesthesia was stopped, the anesthetic pump stopped immediately after the operation, and the patient was kept in a prone position. When TOFC ≥2, neostigmine 50 μg/kg+atropine 10 μg/
kg were given for muscle relaxation antagonism, and when the patient’s TOFR ≥0.9, BIS ≥80, and tidal volume ≥6 ml/kg, the endotracheal tube was removed after sufficient negative pressure suction of secretions in the oral and endotracheal tube. Once the vital signs were stable, the patient was placed in a transfer bed with the assistance of an anesthesiologist and an endoscopic nurse and then transferred to the PACU for further observation.

PACU management: when the patient awoke, the directional ability was restored, vital signs were stable, no nausea and vomiting, no other discomfort symptoms, and with a Steward score ≥5 points the patient was sent back to the ward with nursing assistance.

Outcome Measures
Cough severity: a stopwatch was used to monitor the time. After injection, the symptoms of the explosive cough, including the number and severity, were recorded within 1 min by an anesthetist nurse who was blinded to the study. Depending on the number of coughs within 1 min, the patient was classified into four grades: 0 (no cough), 1 (mild, 1-2 times), 2 (moderate, 3-5 times), and 3 (severe, >5 times).

Hemodynamic changes: the indices, including BP and HR, were measured using the same automated monitoring device at basal heart rate and blood pressure before induction of anesthesia, immediately before extubation and 1, 2, 3, 4, 5, 15 and 30 minutes after intubation. All measurements were recorded by the same anesthesia technician, who had no information about the patient’s group.

Adverse events: adverse events during anesthesia recovery were recorded, and included nausea and vomiting, hypoxemia, fluctuation of blood pressure, intraoperative awareness, somnolence, and emergency delirium.

Statistical Analysis
This study adopts descriptive statistics. Data are expressed as mean±standard deviation for continuous variables or n patients (%).

Results
All 15 inpatients who underwent ERCP elective surgery were successfully extubated in the prone position postoperatively. The patient characteristics are shown in Table 1. The average age was 63.5±9.3 (48-82) years old, and the weight was 73.9±12.1 kg. There were no obese patients. The preoperative ASA classification was I-III. 7 (46.7%) patients had a history of smoking, 8 (53.3%) patients were diagnosed with hypertension before the operation, 4 (26.7%) patients were diabetic, and 5 (33.4%) patients had dyslipidemia.

After general anesthesia, the tracheal tube was successfully removed in the prone position. No patient had a serious cardiovascular event, no severe hypoxemia was detected, and no unplanned extubation or emergency secondary intubation occurred. The average anesthesia time was 74.5±7.7 minutes. 2 out of 15 patients had transient hypoxemia, SPO2 was lower than 95%, and they returned to normal after being pressurized and oxygenated by the mask; 7 (46.7%) patients had cough after the tube was extubated and 4 (26.7%) patients were diabetic, and 5 (33.4%) patients had dyslipidemia.

In addition, we found that patients who cough after tube extubation were 60 years old or older. But they were recovered without any special treatment. Another patient had transient hemodynamic fluctuations after extubation, mean airway pressure (MAP) was higher than 20% of the basic value, and hemodynamics was stable after drug treatment (Tables II-III).

The hemodynamics of all patients were basically stable at each monitoring point, and there were no continuous and dramatic fluctuations in blood pressure or heart rate. After extubation,
Tracheal extubation in prone position after general anesthesia

Tracheal extubation in prone position after general anesthesia, so as to ensure the optimal treatment of the patient’s disease and promote the accelerated postoperative recovery. In view of the continuous advances in minimally invasive surgical techniques and the continuing demand for quality healthcare, Enhanced Recovery After Surgery (ERAS) aims to provide patients with rapid recovery based on the pathophysiological characteristics of the patient in the perioperative period, using many methods of evidence-based medicine to reduce the discomfort or other side effects of surgery. Over the past few years, ERAS has proven to be useful in various types of surgeries. Surgical treatment under endoscopic management is a new surgical modality alternative to conventional treatment. The concept of ERAS is currently in clinical use and studies have confirmed its feasibility and superiority in ERCP for the treatment of common bile duct stones. In clinical practice, how to explore a more optimized ERCP anesthetic program is an interesting topic to be studied in the future.

they were sent to PACU for observation. All patients reached the PACU standard within 30 minutes (Figure 1).

Discussion

With the rapid development of endoscopic technology in the field of surgery, ERCP is widely accepted for the diagnosis and treatment of biliary diseases. Compared with traditional surgical procedures, ERCP has the advantages of less trauma, high precision, good safety and quick postoperative recovery. As a new medical service mode, “comfortable medical treatment” and “painless medical treatment” have put forward higher requirements for clinicians, especially anesthesiologists. Anesthesia work should be aimed at providing the optimal operating conditions, ensuring the patient’s life safety and minimizing the operation pain, so as to ensure the optimal treatment of the patient’s disease and promote the accelerated postoperative recovery. In view of the continuous advances in minimally invasive surgical techniques and the continuing demand for quality healthcare, Enhanced Recovery After Surgery (ERAS) aims to provide patients with rapid recovery based on the pathophysiological characteristics of the patient in the perioperative period, using many methods of evidence-based medicine to reduce the discomfort or other side effects of surgery. Over the past few years, ERAS has proven to be useful in various types of surgeries. Surgical treatment under endoscopic management is a new surgical modality alternative to conventional treatment. The concept of ERAS is currently in clinical use and studies have confirmed its feasibility and superiority in ERCP for the treatment of common bile duct stones. In clinical practice, how to explore a more optimized ERCP anesthetic program is an interesting topic to be studied in the future.

Table II. Adverse events related to extubation and anesthesia time.

<table>
<thead>
<tr>
<th>Case</th>
<th>Age</th>
<th>ASA Rating</th>
<th>Anesthesia Time (min)</th>
<th>Adverse events related to extubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66</td>
<td>II</td>
<td>68</td>
<td>Nothing</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>II</td>
<td>72</td>
<td>Cough</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>III</td>
<td>81</td>
<td>Cough, transient hypoxemia, recovery after mask oxygen</td>
</tr>
<tr>
<td>4</td>
<td>61</td>
<td>II</td>
<td>79</td>
<td>Cough</td>
</tr>
<tr>
<td>5</td>
<td>82</td>
<td>III</td>
<td>80</td>
<td>Cough</td>
</tr>
<tr>
<td>6</td>
<td>79</td>
<td>III</td>
<td>90</td>
<td>Cough</td>
</tr>
<tr>
<td>7</td>
<td>73</td>
<td>III</td>
<td>85</td>
<td>Cough</td>
</tr>
<tr>
<td>8</td>
<td>52</td>
<td>II</td>
<td>79</td>
<td>Nothing</td>
</tr>
<tr>
<td>9</td>
<td>60</td>
<td>II</td>
<td>70</td>
<td>Hemodynamic fluctuations, recovery after treatment with antihypertensive drugs</td>
</tr>
<tr>
<td>10</td>
<td>48</td>
<td>I</td>
<td>68</td>
<td>Nothing</td>
</tr>
<tr>
<td>11</td>
<td>53</td>
<td>I</td>
<td>71</td>
<td>Nothing</td>
</tr>
<tr>
<td>12</td>
<td>60</td>
<td>III</td>
<td>75</td>
<td>Nothing</td>
</tr>
<tr>
<td>13</td>
<td>61</td>
<td>II</td>
<td>69</td>
<td>Cough</td>
</tr>
<tr>
<td>14</td>
<td>64</td>
<td>II</td>
<td>60</td>
<td>Transient hypoxemia, recovery after mask oxygen</td>
</tr>
<tr>
<td>15</td>
<td>66</td>
<td>II</td>
<td>71</td>
<td>Nothing</td>
</tr>
</tbody>
</table>

Table III. Cough severity and count for patients (n=15).

<table>
<thead>
<tr>
<th>Cough severity</th>
<th>After extubation</th>
<th>1 min</th>
<th>2 min</th>
<th>3 min</th>
<th>4 min</th>
<th>5 min</th>
<th>10 min</th>
<th>20 min</th>
<th>30 min</th>
<th>1 h</th>
<th>Total, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild, n (%)</td>
<td>1 (6.7)</td>
<td>1 (6.7)</td>
<td>1 (6.7)</td>
<td>0 (0)</td>
<td>1 (6.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>4 (26.7)</td>
</tr>
<tr>
<td>Moderate, n (%)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (6.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (6.7)</td>
<td>0 (0)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Severe, n (%)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (6.7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td>Total, n (%)</td>
<td>1 (6.7)</td>
<td>1 (6.7)</td>
<td>2 (13.3)</td>
<td>0 (0)</td>
<td>2 (13.3)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td>1 (6.7)</td>
<td>0 (0)</td>
<td>7 (46.7)</td>
</tr>
</tbody>
</table>
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sia management plan, effectively improving the safety and comfort of ERCP patients during the perioperative period and reducing intraoperative and postoperative complications are urgent issues for clinical anesthesiologists.

At present, the main anesthesia methods of ERCP include intravenous anesthesia and tracheal intubation general anesthesia. Under non-tracheal intubation general anesthesia, intraoperative hypoxia or even severe hypoxia-induced arrhythmias cannot be avoided regardless of the mode of ventilation (including nasal cannula, endoscopic mask, nasopharyngeal airway, etc.) due to the patient’s own factors, endoscopic operating factors, respiratory depression from the anesthetic or the patient’s prone position. Endotracheal intubation is the most effective and reliable ventilation method for the establishment of an artificial airway, especially in the case of higher ASA grade, poor systemic condition, obesity, pyloric obstruction, stomach saturation, and pancreatic pseudocyst drainage, etc., endotracheal intubation can better manage the airway and effectively reduce the risk of intraoperative hypoxemia and aspiration. In 2011, the Quality Committee of the American Society of Gastrointestinal Endoscopy classified ERCP surgery into grades 1 to 4 according to the difficulty of the operation. Of these, levels 1-2 are generally considered to be less difficult and require a shorter operative time, while levels 3-4 are more difficult and require a longer operative time. In contrast, the more complex the procedure and the longer it takes, the easier is to control the effects of tracheal intubation with general anesthesia. As most of the surgical levels in the authors’ hospital are class 3-4, all patients in this study were operated under tracheal intubation anesthesia. In our study, however, there were two ASA I cases, eight ASA II cases, and five ASA III cases, with ASA II being more than half of the total patients we included.

In a retrospective study, researchers found that “anesthesia time” (total time minus operation time) is an important factor affecting the total time of ERCP. Experienced anesthesiologists can shorten this time and reduce anesthesia. This suggests that although the surgical procedure is considered safe, there are still many anesthetic-related complications during anesthesia induction, maintenance, and recovery in ERCP patients undergoing endotracheal intubation general anesthesia. Relatively, compared with the induction and maintenance of anesthesia, the recovery period of anesthesia is more dangerous. Issues such as the smoothness of the resuscitation process, the timeliness of extubation and the effective control of airway stress are more important factors in determining the quality of ERCP anesthesia. How to optimize the process of anesthesia management and increase the controllability during the recovery period from general anesthesia is a problem worthy of in-depth discussion by clinical

Figure 1. Changes in hemodynamics at different time points. The value is the mean±standard deviation. BL: baseline, basal heart rate, and blood pressure before induction of anesthesia; EX: heart rate and blood pressure immediately before extubation.
Tracheal extubation in prone position after general anesthesia

Currently, a relatively conventional method of anesthesia resuscitation. Although this operation is prone to the supine position after the operation in China are to turn the patient’s position from the supine position to the prone position for the extubation of ERCP patients after anesthesia. This shows that it is feasible to adopt the prone position for extubation of the tracheal tube. It is, therefore, more reasonable to consider a prone position for extubation of the tracheal tube at the end of anesthesia in such patients. Studies have shown that the rational use of medication, such as intravenous lidocaine prior to extubation, could suggest an alternative to routine supine extubation and reduce the cough reflex, compared to supine and prone extubation. Therefore, on the basis of previous studies, we applied prone extubation in the post-anesthesia resuscitation of ERCP patients with endotracheal intubation under general anesthesia. A series of case studies were prospectively conducted in this study to confirm the feasibility of applying prone extubation after ERCP in the case of only changing the extubation position without changing medication.

The results showed that the prone position after general anesthesia of ERCP was successful in removing the tracheal tube. Oxygenation occurred, and there were no cases of unplanned extubation or urgent secondary intubation. All patients were hemodynamically stable at each monitoring point, and there were no continuous and severe fluctuations in blood pressure or heart rate. After extubation, patients were sent to PACU for observation. All patients reached the standard for leaving the room within 30 minutes. Moreover, all patients were satisfied with the procedure and the anesthetic and would choose this technique again. This shows that it is feasible to adopt the prone position for the extubation of ERCP patients after

anesthesiologists. Gunenc et al reported that the anesthesia duration time of patients operated for lumbar disc herniation was 176±50 min and the proportion of the mild cough patients was 53.8%, but the proportion of mild cough patients in the previous study was higher than the figures in our study, suggesting that shorter anesthesia duration time could reduce the severity of cough after extubation. We also found that the cough concentration occurred within half an hour of extubation, so more attention should be paid to relieving the patient’s airway discomfort and strengthening observation to avoid more serious adverse airway effects. Before the operation, nurses should strengthen the management of patients’ airway and avoid bad living habits, such as smoking and drinking, to help patients maintain better airway conditions, promote their rapid recovery after operation, and improve postoperative quality of life.

There is still no uniform standard among national and international scholars regarding the management of ERCP anesthesia in the postoperative recovery and extubation of patients. At present, the conventional treatment measures in China are to turn the patient’s position from the prone to the supine position after the operation and anesthesia, and then perform general anesthesia resuscitation. Although this operation is currently a relatively conventional method of resuscitation in China, researchers believe that it is not optimal, given that turning the body position not only requires more labor and time costs but also it is easy to change the body position during the turning process. Associated complications, such as lack of airway management, loss of monitoring, severe cough, severe hemodynamic fluctuations, occurrence of hypoxaemia, prolonged extubation times and even muscle or joint injuries, are all adverse events that are more likely to occur. Especially for elderly patients or patients with more sensitive airways, severe hemodynamic fluctuations and the stress-induced cough response caused by turning over are often more harmful. Our study also pointed out that patients who cough after extubation are 60 years old or older and that the trachea and bronchi of older people are more sensitive to external stimuli. Therefore, the position of extubation, the timing of extubation, and the control of related complications should become the focus of our attention. It is known that mechanical ventilation in the prone position can provide patients with a better oxygenation state. Is it feasible to extubate in the prone position? This is a question worthy of in-depth consideration by anesthesiologists. In fact, as early as 2000, American scholars Olympio et al compared the extubation position of patients with lumbar spine surgery under general anesthesia and proposed that for patients who underwent general anesthesia in the prone position, the process of changing the patient to the supine position after the operation, tachycardia, high blood pressure, severe coughing, etc. often occur in the middle, which leads to a variety of complications, and it is believed that the above symptoms are caused by excessive stimulation of the airway by the tracheal tube. In this study to confirm the feasibility of applying prone extubation after ERCP in the case of only changing the extubation position without changing medication.

The results showed that the prone position after general anesthesia of ERCP was successful in removing the tracheal tube. Oxygenation occurred, and there were no cases of unplanned extubation or urgent secondary intubation. All patients were hemodynamically stable at each monitoring point, and there were no continuous and severe fluctuations in blood pressure or heart rate. After extubation, patients were sent to PACU for observation. All patients reached the standard for leaving the room within 30 minutes. Moreover, all patients were satisfied with the procedure and the anesthetic and would choose this technique again. This shows that it is feasible to adopt the prone position for the extubation of ERCP patients...
general anesthesia. In addition, the prone position for extubation has the advantage of significantly reducing the duration of anesthesia, extubation time and observation time in the recovery room due to the fact that the patient does not need to be turned passively while under anesthesia and the immediate postoperative cessation of anesthesia increases the satisfaction of the endoscopist.

It is worth noting that the above studies have also emphasized the importance of patient selection in the design of prone extubation. Among them, patients with morbid obesity and difficult airways are not suitable for prone extubation. The safe management of the airway is, therefore, the main limiting factor for extubation in the prone position. It is, therefore, very important to assess the patient’s airway prior to the prone extubation technique. Airway management issues following general anesthetic extubation, muscle relaxation and the legacy of over-sedation are also major factors affecting airway safety. So how should we ensure airway safety in actual clinical work, shorten the time of extubation, and ensure the safety of extubated patients in prone position? We need to expand the clinical sample size, compare the safety and efficiency of prone extubation with conventional supine extubation through further randomized controlled studies, and explore whether prone extubation can effectively reduce severe hemodynamic fluctuations and reduce the period of resuscitation. Can the incidence of adverse events related to extubation be able to reduce the incidence of sore throat, nausea, dysphonia and other uncomfortable symptoms after surgery, and increase patients’ satisfaction with the surgical anesthesia process? Future studies are warranted to investigate the answer.

Conclusions

This study shows that it is feasible to remove the tracheal tube in the prone position after intubation of general anesthesia ERCP patients. However, a larger sample size is needed to validate its safety, and studies that examine whether there are advantages in the extubation technique in a prone position over a supine position are warranted.

Informed Consent

Patients provided written informed consent.

Ethics Approval

This study was approved by the institutional Ethics Committee of the Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine (SG2020/03-23).

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Conflict of Interest

The authors declare no conflicts of interest

Authors’ Contributions

Guarantor of integrity of the entire study: Jian-gang Song
Study concepts: Jin-Hui Xiang
Study design: Jin-Hui Xiang and Pan Wei
Definition of intellectual content: Jin-Hui Xiang
Literature research: Pan Wei and Wei Yuan
Clinical studies: Pan Wei and Jin-Hui Xiang
Experimental studies: Pan Wei and Jin-Hui Xiang
Data acquisition: Wen-Qing Ruan and Wei Yuan
Data analysis: Wen-Qing Ruan and Xing Li
Statistical analysis: Wen-Qing Ruan and Xing Li
Manuscript preparation: Pan Wei and Jin-Hui Xiang
Manuscript editing: Jian-Gang Song
Manuscript review: Jian-Gang Song and Jin-Hui Xiang

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Availability of Data and Materials

Study data are available on request from the corresponding author.

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