Endotracheal Intubation in a Prone Position in a Patient following Thoracic Spine Penetrating Injuries with Knife

*Faruk Cicekci¹, Zafer Yazkili¹, Adil Akkaya², Inci Kara³

¹Assistant Professor, Department of Anesthesiology and Reanimation, Selcuk University, Medical Faculty Konya, Turkey
²Specialist, Department of Neurosurgical, Konya State Numune Hospital, Konya, Turkey
³Associate Professor, Department of Anesthesiology and Reanimation, Selcuk University, Medical Faculty, Konya, Turkey

Case Report

Received: 10/03/2017
Accepted: 09/05/2017
Published: 13/05/2017

For Correspondence
Faruk Cicekci, M.D.
Department of Anesthesiology, Medical Faculty, Selcuk University, Alaaddin Keykubat Campus, Selcuklu, Konya, Turkey
Contact no: 0090-332-2631001
Fax: 0090-332-2631050
Email: farukcieksi@yahoo.com

Keywords: Anesthesia, Airway Management, Endotracheal Intubation, Prone Position

The prone position is not a standard position for administering anesthesia. Anesthesia is usually administered to a patient placed in the supine position on a stretcher. After endotracheal intubation through the use of a non-kinking and resistant endotracheal tube, the patient is placed in the prone position on the operating table. Emergency surgery to repair thoracic penetrating injuries requires endotracheal intubation in the prone position. In this case study, a patient with a thoracic spinal cord injury was given general anesthesia in the prone position through endotracheal intubation. This study can provide training for anesthetists regarding all airway management scenarios. The study is useful in teaching anesthetists how to maintain airway safety during emergency operations, such as cervical and thoracic spine surgeries while the patient is in the prone position.
INTRODUCTION

Vertebral column surgeries are usually performed while the patient is in the prone position. Traditionally, the patient was adjusted to the prone position for surgery after endotracheal intubation was achieved with the patient in the supine position. However, there have been a few reports of patients undergoing endotracheal intubation with the patient in a prone position [1-2]. One of these cases is because of thoracic penetrating injuries.

Maintaining a secure airway for a patient who has a thoracic penetrating injury can be difficult because of the increased risk of neuropathic damage [3-5]. Since these patients cannot stay in the supine position, they have to be examined while in prone. The endotracheal intubation with direct laryngoscopy in the prone position, performed because of a thoracic spinal injury, was first reported by Zundert et al. in 2008 [1].

In this study, we aim to present a case of a patient intubated with direct laryngoscopy by doing endotracheal intubation in the prone position with a thoracic spinal cord injury.

CASE

A 17-year-old, healthy man was stabbed in his back and was brought to the emergency department. A physical examination revealed that, although very anxious, the patient had a good performance status, was conscious, and was able to cooperate in a limited manner. The patient was hemodynamically stable (mean artery pressure (MAP) 128/67 mmHg, heart rate (HR) 132 beats/min, respiratory rate 18-25/min, and oxygen saturation (SpO2) 96 %). However, there was a 2 cm laceration on the patient’s back limiting his movement (Figure 1). Hypoesthesia between his T4-T6 levels and hemiparesis in his right leg were discovered during a neurologic examination. The deep tendon reflex was normal. In order to confirm anamnesis and to block hemiparesis, a thoracic X-ray and computed tomography were done with the patient in the prone position. When the medical examinations were completed, a fragment of a broken knife was detected. It had penetrated into the vertebral body at the level of T7 and had partially severed the spinal cord at the T6-T7 level (Figures 1A, 1B, and 2). There was no penetration to the thorax or the mediastinum. Hemoglobin, blood sugar level, blood urea level, serum electrolytes, bleeding time, coagulation time, and echocardiography (EKG) were within normal limits. The patient was quickly taken to the operating room for emergency surgery. A head and neck examination revealed that the neck girth, head and neck movement, and mouth opening were normal. Because the surgical team was concerned about the patient’s neurological sequel progression, the patient was taken to the operating table in the prone position. The patient and his relatives were informed and their written consent was obtained. All the preparations for both the airway control and the surgery were made while the patient was in the prone position. Lactated Ringer’s solution (3–6 ml/kg per h) was infused via two intravenous lines throughout surgery.
Figure 1 (A), 1(B): Computed tomography images of the broken blade by injuring the spinal cord extending into the vertebral body.

Figure 2: Direct laryngoscopy and endotracheal intubation with the patient in the prone position (the anesthesiologist is sitting on the floor-laryngoscope in the right hand, and another anesthesiologist is holding the patient’s head.)
The patient's chest was supported with two silicon pillows. His face, knees, and pelvis were also supported with a few backings in order to decrease his intra-abdominal pressure and manage his ventilation. When he was supported in this manner, the surgical team ensured that his vertebral column was stabilized. Due to possible airway management problems, fiber optical laryngoscopy, laryngeal mask, direct laryngoscopy, and different sized silicon spiraled endotracheal tubes were prepared. The patient's neck was adjusted to the right and his SpO2 level was increased to 100% through the administering of 5 liters of oxygen per minute. To reduce the risk of any airway-sourced neurological problems, a spinal board was placed under the patient. This made it possible to safely adjust the patient to the supine position if required. A sufficient number of medical personnel were used to prepare the patient in this manner. Anesthesia was then introduced using 1 µg.kg⁻¹ fentanyl and 2.5 mg.kg⁻¹ propofol. Since there was not any force detected in mask ventilation, 0.5 mg.kg⁻¹ rocuronium bromide was applied intravenously. As the patient was freely ventilated, endotracheal intubation with direct laryngoscopy was applied first. Shortly afterwards, the patient was intubated with a spiraled tube. The intubation accuracy was confirmed through auscultation and capnography. During the operation, the patient’s invasive artery, heart rate, and oxygen saturation were monitored using end-tidal carbon dioxide (EtCO2). A rocuronium bromide of 50% sevoflurane + 50% air, 1µg.kg⁻¹ fentanyl, and 0.2 mg.kg⁻¹ was used for anesthesia progression. A laminectomy was required to remove the broken fragment of the knife that was lodged in the patient’s vertebral body, after which the injury was repaired.

The operation took 165 minutes and the muscle relaxation effect was reversed with 2 mg.kg⁻¹ of Sugammadex. After the patient’s spontaneous inhalation returned, he was extubated and taken to the recovery room. There were no complications during the surgery or during the postoperative process. During the postoperative neurologic examination, 20% paresis and slight hypoesthesia were observed in his right leg. There was no stool or urea incontinence. The patient was taken to the intensive care unit and discharged after six days.

**DISCUSSION**

The prone position is not a standard position for the administration of anesthesia. It is usually used for various surgeries, including the elective pilonidal sinus excision, varicose vein removal (avulsion), and microdiscectomy in order to maintain surgical access [7]. Traditionally, anesthesia is given to the patient lying in the supine position on a stretcher. Then, after endotracheal intubation through the use of a non-kinking and resistant endotracheal tube, the patient is placed in the prone position on the operating table. Endotracheal intubation in the prone position is only done in emergency cases such as posterior thoracic and cervical spine injuries [6-9]. This position includes in airway intubation compliance with a mask and decreased lung compliance [6-7].

In recent studies, fiber optical laryngoscopy was frequently used for intubation done while the patient was in the prone position [10-13]. Despite this gold standard method [6-9], it requires good patient compliance, special equipment, and technical experience. In this case, a fiber optical laryngoscope was used as a backup.

Another method for endotracheal intubation in the prone position is the use of supraglottic airway equipment, such as a laryngeal mask (LMA), LMA-Fastrack, and LMA ProSeal [7,14,15]. The first intubation in the prone position with a classical LMA was done in the 1990s [16-18]. The supraglottic airway equipment is not as safe as endotracheal intubation equipment while maintaining airway safety in trauma patients [8,19]. Therefore, endotracheal intubation was first used as the safest airway equipment in trauma patients. During emergency or lengthy surgeries, the supraglottic airway equipment may cause edema in the upper respiratory tract [20]. Supraglottic airway equipment is not used during lengthy surgery because of the risks. However, it is used as a backup to maintain airway safety.
There are some disadvantages of endotracheal intubation with direct laryngoscopy. Complications include neurological cervical spine injury, as well as injury to the teeth, pharynx, and larynx. However, in this case, endotracheal intubation was performed without any neurological or anatomic sequelae.

**CONCLUSION**

In the presentation of this case, the endotracheal intubation with direct laryngoscopy was successfully performed. However, it is suggested that anesthetists be trained in all possible airway management scenarios in order to gain experience in maintaining sufficient airway safety. This especially applies to patients operated on in the prone position during emergency operations such as cervical and thoracic spine surgeries.

**DECLARATION OF CONFLICTING INTEREST**

The authors have no conflicts of interest (political, personal, religious, ideological, academic, intellectual, commercial or any other) to declare in relation to this manuscript.

**FUNDING**

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit organization.

**REFERENCES**

2. Santos IA, Oliveira CA, Ferreira L. Life-threatening ventilatory obstruction due to a defective tracheal tube during spinal surgery in the prone position. Anesthesiology 2005;103:214–15


