

Airway management in prone position: a case of knife injury in the posterior spine

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All authors were physicians that were present in this case.

Abstract

Airway management in prone position is a very challenging procedure, predicting a difficult airway situation. We present a case of an adult with knife injury in the posterior spine, needing surgical care. Because of possible dislodgment of the knife with life-threatening complications, supine and lateral decubitus positions were not considered for airway management. To get around this difficulty, we used a fiberoptic intubation through supraglottic device I-gel[®] in prone position, under general anesthesia, to secure the airway. This case shows the use of fiberoptic intubation through an I-gel[®] supraglottic device, in prone position, as a valid choice.

INTRODUCTION

Airway management in prone position is a very challenging procedure. Difficult facial mask ventilation, inability to insert a laryngeal mask airway and difficult endotracheal intubation are possible complications, predicting a difficult airway situation [1, 2].

We present a case of an adult with knife injury in the posterior spine, in close relationship with vital structures needing surgical care.

To prevent further neurological damage, supine position was not suitable which led to difficulties to airway management. To get around this difficulty, we used a fiberoptic intubation through supraglottic device I-gel[®] in prone position, under general anesthesia, to secure the airway.

Permission was obtained from the patient for the publication of this case report.

CASE REPORT

A 28-year-old man, ASA physical status II, victim of knife trauma, was brought by the pre-hospital emergency, immobilized in prone position, still with the knife in his back.

In the emergency room, the patient had a Glasgow Coma Scale of 13 (after opioid administration), eupneic with FiO₂ 35%, without clinical signs of respiratory distress, tachycardic and hypertensive. Neurologically, he presented decreased sensitivity of the lower limbs and



Figure 1. Patient in prone position with dorsal stab wound (the back tattoo was hidden to maintain patient anonymity).

was unable to move the right lower limb. Examination of the dorsal region revealed a knife deep inserted, in the center of the spine, below the shoulder blades (Fig. 1), multiple stabs at thoracodorsal level and right flank. Were administered 3L of crystalloid and 1 g of tranexamic acid.

As the risk for knife movement was real, with consequent worsening of injuries, whenever it was necessary, transfers of the patient were made in a precise and coordinated way, with the help of sheets.

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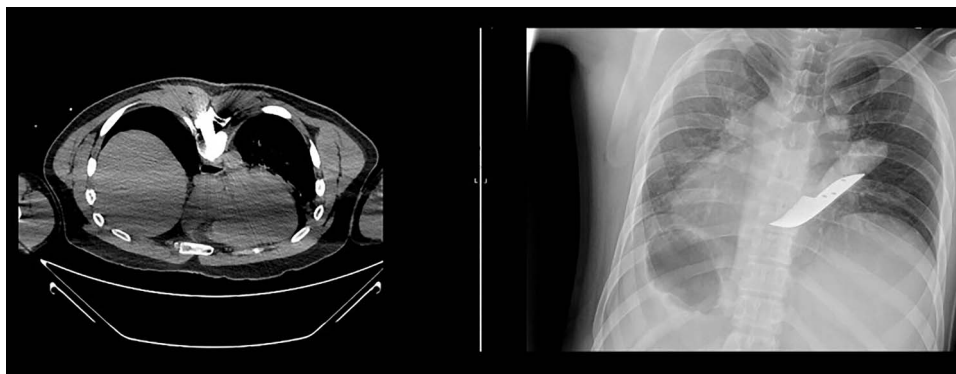


Figure 2. Thoracic CT-scan and X-ray showing knife crossing the posterior vertebral elements and the body of the eighth dorsal vertebra.

A thoracoabdominal pelvic CT-scan, made in prone position, revealed a small pleural effusion on the right lung without pneumothorax and no major vessels lesions. The knife could be seen crossing the posterior vertebral elements and the body of the eighth dorsal vertebra, occupying the vertebral canal, suggesting a probable incomplete spinal cord injury (Fig. 2).

After multidisciplinary evaluation it was decided to remove the knife by surgical exploration, under general anesthesia, followed by exploratory laparoscopy. Because of possible dislodgment of the knife with life-threatening complications, supine and lateral decubitus positions were not considered for airway management.

It was outlined alternative plans for airway management. We planned to intubate the patient in prone position with C-mac[®] videolaryngoscope, with the head slightly rotated, as first attempt. Plan B was to insert an I-gel[®] supraglottic device to assure ventilation and then fiberoptic intubation through the device. Plan C was to intubate the patient in lateral position and plan D would be surgical airway.

The patient was monitored according to ASA Standards and preoxygenated with FiO₂100% for 3 min. Rapid sequence induction was performed with Propofol 2 mg/kg and Rocuronium 1.2 mg/kg.

We started using a C-mac[®] videolaryngoscope in the prone position, with the head turned to the right. The glottis view through the C-MAC screen was a Comarck Lehane 2B, but the first intubation attempt was not successful, due to the difficulty in directing the tube. During this attempt, there was significant desaturation (SatO₂ 70%) with hemodynamic repercussions. Ventilation using a 4-hand face mask with oropharyngeal tube proved to be ineffective and for that we pass to plan B. An I-gel[®] supraglottic device number 5 was inserted with effective ventilation and oxygenation. Fiberoptic intubation through the I-gel[®] was attempted and the intubation of the trachea with 7-mm cuffed orotracheal tube was confirmed by capnography. During airway management the knife was not dislodged.

After surgery, the patient was admitted in the intensive care unit (ICU) intubated and ventilated with vasopressor support. At ICU admission, with the patient already in the supine position, the supraglottic device was removed

without complications by an anesthesiologist, holding the supraglottic airway device, after confirming the difficult airway car was present. The patient was extubated after 48 h, without complications.

DISCUSSION

In a patient with normal neurological examination direct removal of the knife can be a safe option, but in the suspicion of neurological lesions surgical exploration is recommended [3]. This patient had neurological deficits, compatible with damage to the spinal cord with sparing of the right corticospinal tract. Therefore, in order not to cause secondary spinal cord injury, after multidisciplinary evaluation it was decided to remove the knife by surgical exploration, under general anesthesia.

In addition, the patient had multiple stabs at the thoracodorsal level and right flank and although the CT-scan did not report a major vessel lesion, an exploratory laparoscopy was performed afterwards. This decision was taken because the digital exploration showed that there was a violation of the peritoneum. According to the literature, the peritoneum violation is an indication for exploratory laparotomy/laparoscopy [4, 5].

In this case, supine position was not suitable due to prevent further neurological damage. Airway approach in prone position, despite being a predictable difficult airway, might be reserved for extreme emergency situations [6].

There are several approaches described for airway management in prone position, including fiberoptic intubation in awake patient, direct laryngoscopy (with head upside down or turned to one side), videolaryngoscopy and through laryngeal mask Fastrach[®] [6, 7].

Fiberoptic intubation in awake patient is considered one of the best options when facing a difficult airway [1, 8]. However, it demands extensive training in handling the fiberscope, especially in prone position, beyond patient's collaboration [9]. In this case, it was not possible, since the patient was uncooperative, with periods of psychomotor agitation.

The Cochrane Systematic Review demonstrated that the use of C-mac[®] videolaryngoscopy instead of direct

laryngoscopy, especially in difficult airway situations, improves glottis visualization and can reduce the number of failed intubations [9]. Furthermore, the videolaryngoscope with extra-curved blade allows for a better view of the glottis [10].

In this particular case of prone position, without other difficult airway stigmas, we decided to use the C-mac® videolaryngoscope with D-Blade in the first attempt of orotracheal intubation, after rapid sequence induction. Difficulties in videolaryngoscope maneuvering, together with patient desaturation, led to the failure of this technique.

The use of laryngeal mask airway (LMA) in airway rescue has been successfully used in patients in the prone position [1, 2].

A recent study by van Dijck *et al.* demonstrated that the insertion of an LMA in the prone position is quick due to cuff's absence, successful in most patients and may be considered in emergency situations [11]. They also investigated if an I-gel® can function as a conduit for blind orotracheal intubation in the prone position but demonstrated that this was unlikely to succeed [11].

Other study compared fiberoptic intubation through the I-gel® and Fastrach® supraglottic airway devices in supine position and demonstrated that had similar success rates [12]. Nevertheless, the I-gel® allowed a better visualization of the vocal cords, leading to a shorter intubation time [12].

Taking this into account, the I-gel® is an easy, fast and effective option to maintain ventilation and oxygenation in patients in prone position. Furthermore, when patient is in supine position it seems to be a good conduit for fiberoptic intubation, minimizing the risk of esophageal intubation and glottic trauma.

As expected, fiberoptic intubation through a supraglottic airway device was successful. Nevertheless, in the event of some intercurrent, like bloody airway, the use of fiberscope would be limited due to the lack of good airway visualization.

If that would be the case, we had the plan C and D as a rescue plan, since securing the airway is a priority.

To our knowledge, this is the first case in the literature showing fiberoptic intubation through an I-gel® supraglottic device, in prone position, as a valid choice when other approaches are not an option.

CONFLICT OF INTEREST

None of the authors have conflicts of Interest regarding this paper.

FUNDING

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ETHICAL APPROVAL

Nothing to declare.

CONSENT

Patient written consent was obtained and Declaration of Helsinki was respected.

REFERENCES

- van Zundert A, Kuczkowski KM, Tijssen F, Weber E. Direct laryngoscopy and endotracheal intubation in the prone position following traumatic thoracic spine injury. *J Anesth* 2008;**22**:170–2. <https://doi.org/10.1007/s00540-007-0596-9>.
- Samantaray A. Tracheal intubation in the prone position with an intubating laryngeal mask airway following posterior spine impaled knife injury. *Saudi J Anaesth* 2011;**5**:329–31. <https://doi.org/10.4103/1658-354X.84114>.
- Sakar M, Dogrul R, Niftaliyev S, Bayri Y, Dagcinar A. Direct withdrawal of a knife lodged in the thoracic spinal canal in a patient with normal neurologic examination: is it safe? *Spinal Cord Ser Cases* 2016;**2**:16009. <https://doi.org/10.1038/scsandc.2016.9>.
- Taviloglu K. When to operate on abdominal stab wounds. *Scand J Surg* 2002;**91**:58–61. <https://doi.org/10.1177/145749690209100109>.
- Leppäniemi A, Haapiainen R. Diagnostic laparoscopy in abdominal stab wounds: a prospective, randomized study. *J Trauma* 2003;**55**:636–45. <https://doi.org/10.1097/01.TA.0000063000.05274.A4>.
- Baer K, Nyström B. Routine intubation in the prone position. *Ups J Med Sci* 2012;**117**:411–4. <https://doi.org/10.3109/03009734.2012.686125> Epub 2012 May 10. PMID: 22574748.
- Castro-Gómez A, Delgadob LA. Intubacion orotraqueal en pronoc: otra manera para acceder a la via aerea. *Rev Colomb Anestesiol* 2017;**45**:340–3. <https://doi.org/10.1016/j.rca.2017.07.003>.
- Valero R, Serrano S, Adalia R, Tercero J, Blasi A, Sánchez-Etayo G, *et al.* Anesthetic management of a patient in prone position with a drill bit penetrating the spinal canal at C1-C2, using a laryngeal mask. *Anesth Analg* 2004;**98**:1447–50 table of contents. <https://doi.org/10.1213/01.ane.0000111102.52964.7f>.
- Lewis SR, Butler AR, Parker J, Cook TM, Schofield-Robinson OJ, Smith AF. Videolaryngoscopy versus direct laryngoscopy for adult patients requiring tracheal intubation: a cochrane systematic review. *Br J Anaesth* 2017;**119**:369–83. <https://doi.org/10.1093/bja/aex228>.
- Gaszynski T. Intubation in prone position using AirTraq Avant videolaryngoscope. *J Clin Monit Comput* 2019;**33**:173–4. <https://doi.org/10.1007/s10877-018-0128-1>.
- van Dijck M, Houweling BM, Koning MV. Blind intubation through an i-gel® in the prone position: a prospective cohort study. *Anaesth Intensive Care* 2020;**48**:439–43. <https://doi.org/10.1177/0310057X20954443>.
- Moore A, Gregoire-Bertrand F, Massicotte N, Gauthier A, Lallo A, Ruel M, *et al.* I-gel versus LMA-fastrach supraglottic airway for flexible bronchoscope-guided tracheal intubation using a Parker (GlideRite) endotracheal tube: a randomized controlled trial. *Anesth Analg* 2015;**121**:430–6. <https://doi.org/10.1213/ANE.0000000000000807>.