The Channelled Airtraq® as a Rescue Device Following Failed Expected Difficult Intubation with an Angulated Video Laryngoscope

Açılı Videolaringoskop ile Başarısız Beklenen Zor Entübasyonda Kurtarıcı Olarak Kanallı Airtraq

Zehra İpek Arslan 🄳
Department of Anaesthesiology and Reanimation, Kocaeli University School of Medicine, Kocaeli, Turkey

ORCID ID of the author: Z.İ.A. 0000-0003-2968-1092

Abstract / Öz

We herein report two expected difficult intubation cases that failed with an angulated-type video laryngoscope (C-MAC D-blade) and were rescued with a channelled-type Airtraq® device. The common signs and characteristics which indicated difficult ventilation and intubation in these patients were Mallampati 4 (with phonation), mandibular protrusion of B, obstructive sleep apnoea disorder, male gender, and thick neck (>46 cm). We had aids ready in the operating theatre for the anticipated difficult intubation. We first attempted to intubate the trachea in two patients with direct laryngoscopy; as expected, the Cormack-Lehane (CL) grades of the two patients were 4, even cricoid pressure was applied. Second, we attempted to intubate with the angulated-type C-MAC D-blade; the CL grades improved to 2. However, despite tube adjustment manoeuvres and use of a rigid stylet, we were unable to insert the tube into the trachea. Then, we attempted to intubate with a channelled-type Airtraq® device. Consequently, without need for a stylet or use of any manoeuvres, we were able to intubate the tracheas at the first attempt.

Keywords: Airtraq®, C-MAC D-blade, difficult ventilation, difficult intubation

C-MAC D-Balde videolaringoskop ile başarısız olan ve kanallı Airtraq ile kurtarılan iki beklenen zor entübasyon vakasından bahsetmek istedik. Bu hastalardaki zor ventilasyon ve zor entübasyonun ortak belirti ve karakteristikleri; Mallampati 4 (ses ile), mandibula protrüzyonu B, obstrüktif uyku apne sendromuna sahip olmaları, erkek cinsiyet, kalın boyun (>46 cm) idi. Ameliyat odalarında bu cihazları zor entübasyon için hazırlamıştık. İlk olarak, iki hastada da direk laringoskopi ile entübasyonu denedik. Bekenildiği üzere Cormack-Lehane skorları 4 idi. İkinci olarak, C-MAC D-Blade ile entübasyon denedik. Hastaların Cormack-Lehane skorları 2 oldu. Ancak, tüp ilerletme manevraları, rijit stile kullanımına rağmen tüp trakeaya yönlendirilemedi. Sonra kanallı Airtraq ile entübasyon denendi. Sonuçta ne stile kullanımna ne de manevra gereksinimi olmadan ilk denemede hastalar entübe edildi.

Anahtar Kelimeler: Airtraq, C-MAC D-blade, zor ventilation, zor entübasyon

Introduction

The American Society of Anesthesiologists (ASA) states that anaesthesia-related injury or death is due to the inability to secure the airway (1). There are many rescue devices; video laryngoscopes (VLs) are quite popular as they provide better glottis visualisation and higher success rates with difficult airways than direct laryngoscopy. Currently, numerous VLs are already in use; the Macintosh-type (McGrath MAC, C-MAC, and V-MAC), the angulated blade-type with a sharper tip curve than the Macintosh blade (GlideScope, C-MAC D-blade, McGrath MAC X-Blade) and the tube channelled-type (Airtraq®, Pentax-AWS) (2). Due to their evident success, VLs have assumed an important position among new unexpected difficult airway management algorithms (3, 4). Studies have been published about the effectiveness of VLs in the man-

agement of failed direct laryngoscopy (5, 6). However, failed video laryngoscopy or expected difficult intubation is a subject of debate. We present here two cases of failed expected difficult intubation with an angulated blade-type VL that were rescued with a channelled blade-type device.

Case Presentations

Case 1

One patient was male, aged 66 years, with ASA physical status II and chronic obstructive lung disease; his body mass index (BMI) was 35.9 (weight, 110 kg; height, 175 cm), and he was to undergo elective open nephrectomy. The preoperative anaesthesia evaluation revealed that he had a history of obstructive sleep apnoea, Mallampati 4 (with phonation), thyromental distance (TMD) >6 cm, normal inter-incisor distance, a lack of teeth, a thick neck and normal neck

mobility. He had no history of difficult intubation and no previous operations. The patient was pre-oxygenated via a face mask. Standard anaesthesia induction was applied with propofol and fentanyl. Face mask ventilation was achieved with two-handed airway insertion, and the jaw thrust method was applied (7). Next, 0.6 mg kg^{-1} rocuronium bromide was administered for muscle relaxation. We planned to look first with the Macintosh blade; the Cormack-Lehane (CL) grade was 4. Then, an experienced user (>50 intubations with the C-MAC D-blade) tried to intubate with the C-MAC D-blade VL. We tried to intubate the trachea with the D-blade, and the CL grade improved to 2. A 90° counter-clockwise rotation manoeuvre, cricoid pressure and stylet were used, but insertion of the tube into the vocal cords was impossible. Then, the Airtraq® was used; the CL was 1, and the patient was intubated without any manoeuvres.

After the procedure, he was transported to our intensive care unit (ICU) while intubated and was extubated with an airway exchange catheter in the ICU. We then recorded his other parameters in the ICU; his TMD was 7 cm, sternomental distance (SMD) was 14 cm, inter-incisor distance was 4 cm, mandibular protrusion was B (upper incisors were brought edge-to-edge with the lower incisors) and neck circumference was 48 cm (Figure 1). Informed consent was obtained from the patient.

Case 2

The second patient was male, aged 46 years, with ASA physical status II and hypertension; his weight was 95 kg, height was 178 cm and BMI was 29.9. He was to undergo elective surgery for pituitary adenoma secreting growth hormone. The preoperative anaesthesia evaluation revealed that he had a history of obstructive sleep apnoea and Mallampati 4 (with phonation); TMD appeared to be >6 cm, with full neck mobility and normal inter-incisor distance. His teeth were normal and full. He had macroglossia. The patient was pre-oxygenated via a face mask. Standard anaesthesia induction was applied with propofol and fentanyl. Face mask ventilation was achieved with two-handed airway insertion, and the jaw thrust method was applied. Of note, 0.6 mg kg^{-1} rocuronium bromide was then administered for muscle relaxation. An anaesthesia resident with 4 years of experience attempted to intubate with the Macintosh blade 3 and 4; they both failed. An experienced user (>50 intubations with the C-MAC D-blade) tried to intubate with the C-MAC D-blade; the CL improved to 2, but directing the tube into the trachea failed, despite cricoid pressure, counter-clockwise rotation and stylet. Then attempted to intubate with the Airtraq®; the CL was 2, and the trachea was successfully intubated at the first attempt without any manoeuvres. After the procedure, the patient was extubated with sugammadex (bridion; Merck Sharp & Dohme Ltd., Hertforshire, UK) and was fully awake. His airway characteristics recorded at that time were inter-incisor distance of 4.5 cm, TMD of 10 cm, SMD of 5 cm, neck circumference

Figure 1. Case 1: A 66-year-old male undergoing elective open nephrectomy

Figure 2. Case 2: A 46-year-old male undergoing elective surgery for pituitary adenoma with secreting growth hormone

of 48 cm and mandibular protrusion of B type (Figure 2). Informed consent was obtained from the patient.

Discussion

The work of Langeron et al. (7) has been added to by the work of Kheterpal et al. (8), and obesity, snoring, limited jaw movement and abnormal neck anatomy have been identified as risk factors for both difficult mask ventilation and intubation. In our two patients, mandibular protrusion B, snoring,

Mallampati 4 and thick neck (46 cm long) were the common predictors of difficult mask ventilation and difficult intubation. In addition, intubation is more difficult in males than in females, obese patients (9).

The Macintosh-type and angulated blade-type VL seem more likely to be utilised by experienced anaesthesiologists with traditional direct laryngoscopy. The channelled-type VLs have shorter learning curves than the other VLs for experienced or novice laryngoscopists (10). The Macintosh-type VLs do not require the use of a stylet, but the angulated blade-type VLs mostly require a rigid stylet for insertion of the tube into the trachea. However, despite this, using a stylet tracheal intubation might be difficult. The channelled-type is designed to reduce the difficulty encountered when inserting the tube into the trachea (11).

Awake fiberoptic intubation is the gold standard for expected difficult intubations. However, fiberoptic intubation is very complex and expensive, requires a skilled investigator and takes time. In addition, inserting the tube into the trachea is a blind process that can cause airway trauma, oedema or bleeding. Moreover, bleeding or secretions can prevent visualisation (12). There is a published case report of a failed VL intubation in a patient with diffuse idiopathic skeletal hyperostosis and spinal cord injury who was rescued with a fiberoptic intubation (13). Had the attempt been made with another type of VL, the result would have been different. Will this increase our success rate? We do not know. As such, fiberoptic intubation always holds its ground in all difficult airway algorithms.

Conclusion

There is a need for future case reports and randomised trials that investigate failures of video laryngoscopy. In addition, we need a new algorithm to manage expected difficult intubations and also failures of VLs (14). This will be improved if VLs can be used as a first-line device to decrease the steps required in expected difficult intubations. The correct use of VLs according to shape and limitations needs to be well defined. The provider must be familiar with the proper role of each type of viedolaryngoscope in sale (15).

References

1. Peterson GN, Domino KB, Caplan RA, Posner KL, Lee LA, Cheney FW. Management of the difficult airway: a closed claim analysis. Anesthesiology 2005; 103: 33-9. [CrossRef]
2. Paolini JB, Donati F, Drolet P. Review article: Video-laryngoscopy: another tool for difficult intubation or a new paradigm in airway management? Can J Anaesth 2103; 60: 184-91.
3. Practice guidelines for management of the difficult airway. An updated report by the American Society of Anesthesiologists Task Force on Management to the Difficult Airway. Anesthesiology 2103; 118: 251-70.
4. Frerk C, Mitchell VS, McNarry AF, Mendonca C, Bhagrath R, Patel A, et al. Difficult Airway Society intubation guidelines working group. Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. Br J Anaesth 2015; 115: 827-48. [CrossRef]
5. Kilicaslan A, Topal A, Tavlan A, Erol A, Otelcioglu S. Effectiveness of the C-MAC video laryngoscopes in the management of unexpected failed intubations. Braz J Anesthesiol 2014; 64: 62-5. [CrossRef]
6. Maharaj CH, Costello JF, McDonnell JG, Harte BH, Laffey JG. The Airtraq as arescue airway device following failed direct laryngoscopy: a case series. Anaesthesia 20017; 62: 598-601.
7. Langeron O, Masso E, Huraux C, Guggiari M, Bianchi A, Coriat P, et al. Prediction of difficult mask ventilation. Anesthesiology 2000; 92: 1229-36. [CrossRef]
8. Kheterpal S, Han R, Tremper KK, Shanks A, Tait AR, O'Reilly M, et al. Incidence and predictors of difficult and impossible mask ventilation. Anesthesiology 2006; 105: 885-91. [CrossRef]
9. Ezri T, Gewürtz G, Sessler DI, Medalion B, Szmuk P, Hagberg C, et al. Prediction of difficult laryngoscopy in obese patients by ultrasound quantification of anterior neck soft tissue. Anaesthesia 2003; 58: 1111-4. [CrossRef]
10. Asai T. Videolaryngoscopes: do they truly have roles in difficult airways? Anesthesiology 2012; 116: 515-7.
11. Fiadjoe JE, Kovatsis P. Videolaryngoscopes in pediatric anesthesia: what's new? Minerva Anestesiologica 2014; 80: 76-82.
12. Arslan ZI, Ozdal P, Ozdamar D, Agır H, Solak M. Nasotracheal intubation of a patient with restricted mouth opening using a McGrath MAC X-Blade and Magill forceps. J Anesth 2016; 30: 904-6. [CrossRef]
13. Thompson C, Moga R, Croscby ET. Failed videolaryngoscope intubation in a patient with diffuse idiopathic skeletal hyperostosis and spinal cord injury. Can J Anaesth 2010; 57: 679-82. [CrossRef]
14. Panditt JJ, Marshall SD. The 2015 Difficult Airway Society Guidelines: what about anticipated difficult airway? A reply. Anaesthesia 2016; 71: 466-79. [CrossRef]
15. Marshall SD, Pandit JJ. Radical evolution: the 2015 Difficult Airway Society guidelines for managing unanticipated difficult or failed tracheal intubation. Anaesthesia 2016; 71: 131-7. [CrossRef]