

REVIEW / DERLEME

NEW TRENDS IN INTUBATION FOR THE DIFFICULT AIRWAY MANAGEMENT**ZOR HAVAYOLU YÖNETİMİNDE ENTÜBASYONDA YENİ YÖNELİMLER****Nesrin BOZDOĞAN ÖZYILKAN****Baskent University Faculty of Medicine, Department of Anesthesiology and Reanimation, Adana, Turkey**

Başkent Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon Anabilim Dalı, Adana, Türkiye

SUMMARY

Airway management is a critical part of anesthesia practice. Difficulty in airway management presents a continuing challenge to the anesthesiologist. Education for adherence to algorithms for difficult airway management and exercising various airway skills in advance are the keys for successful and safe management of expected and unexpected difficult airway. Innovation over the past 25 years in the field of the airway management has led the proliferation of new and improved techniques and devices. New trends in the management of difficult airway are based on developing novel imaging techniques rather than promoting blind techniques.

Currently, there is no technique found to be effective in every case or that can solve all airway problems. It is not the latest device or technique that can solve an airway management problem, but the anesthesiologist's experience and skill with the device and technique that anesthesiologist practices well and daily.

KEY WORDS: Airway management, Difficult airway, Intubation, New trends

ÖZET

Havayolu yönetimi anestezi pratiğinin önemli parçalarından biridir. Havayolu yönetimindeki zorluklar da anestezi uzmanları için her zaman olası sorunlardan birini oluşturur. Beklenen ya da beklenmeyen zor havayolunun başarılı ve güvenli bir şekilde yönetimi sırasında algoritmalara uyum ve çeşitli havayolu becerilerinin önceden deneyimlenerek uygulanması ana noktalarlardır. Havayolu yönetimi alanındaki son 25 yıl içerisindeki gelişmeler yeni ve gelişmiş teknikler ile araçların üretilmesini sağlamıştır. Zor havayolu yönetimindeki yenilikler ise kör tekniklerden daha ziyade, özellikle yeni görüntüleme tekniklerinin üzerine yönelmiştir.

Şu anda her türlü havayolu problemini çözebilecek ya da her hastada uygulanacak kadar etkin tek bir teknik bulunmamaktadır. Havayolu yönetimindeki problemin çözümü en son teknoloji ya da alet veya teknik değildir; bunun yerine anestezi uzmanının günlük pratiğinde bildiği, uygun bir şekilde kullanabildiği, kendi deneyim ve becerisine dayanan alet ve teknikleri uygulamasıdır.

ANAHTAR KELİMELE: Havayolu yönetimi, Zor havayolu, Entübasyon, Yeni yönelimler

INTRODUCTION

Airway management is one of the most critical tasks of anesthesiologists. While an expected difficult airway requires necessary preparations beforehand, an unexpected difficult laryngoscopy or intubation may lead to an increase in morbidity or mortality (1,2). The incidence of difficult laryngoscopy or difficult intubation reportedly ranges from 1% to 18%, and failed intubation takes place in about 0.05-0.35% of patients in whom difficult laryngoscopy is encountered (1,3). Studies from USA and UK hold it responsible for 50% of anesthesia-related deaths or serious brain damages, stressing the importance of the issue (4,5).

What is a difficult airway then?

According to the American Society of Anesthesiologists (ASA), a difficult airway is defined as "a clinical situation in which a conventionally trained anesthesiologist experiences difficulty with face mask ventilation of the upper airway, difficulty with tracheal intubation or both" (6,7).

Encountering such difficulties in airway management has led to the utilization of various different blades and techniques and the development of novel tools for airway management particularly in the last 20-25 years. With the new developments in this field, airway management is now more efficiently achieved using difficult airway management algorithm of ASA and national algorithms based on it (7).

Çıkar çatışması/Conflict of Interest: Yazarlar herhangi bir çıkar çatışması bildirmemişlerdir./ *Authors do not report any conflict of interest.*

Geliş tarihi/Received: 28/02/2016

Kabul tarihi/Accepted: 22/03/2016

Yazışma Adresi (Correspondence):

Dr. Nesrin Bozdoğan Özyılkan, Başkent Üniversitesi Adana Uygulama ve Araştırma Merkezi, 01250, Yüreğir, Adana, Türkiye

E-posta (E-mail): nesrinbozdogan@yahoo.com

AIRWAY EVALUATION

During airway evaluation, a patient's past history and physical examination can become decisive for both difficult mask ventilation and difficult intubation. A patient's congenital (Pierre-Robin syndrome, Treacher-Collins syndrome, mucopolysaccharidoses, achondroplasia, Down's syndrome, and micrognathia) or acquired (morbid obesity, acromegaly, ankylosing spondylitis, obstructive sleep apnoea, infections of the airway, rheumatoid arthritis, tumors involving the airway, trauma of airway or cervical spine, large goiter) diseases can be associated with a potentially difficult airway (8). It is known that pregnancy may also increase the incidence of difficult intubation to as high as 6.4% (4,6). In recent years it has been claimed that some medications can lead to difficult airway such as long-term use of angiotensin-converting enzyme inhibitors (4).

Although there exist many methods such as Mallampati classification, head-neck motility, measurement of sternomental and thyromental distances, and Wilson risk scoring for predicting difficult intubation, none of them is sufficient enough for exactly predicting expected or unexpected difficult intubation (1,6,8). It has been reported that the best predictor is the combined use of Mallampati score and Wilson risk score, with a sensitivity of 100%, a specificity of 96.2%, and a positive predictive value of 64.8% (4,6).

NEW TRENDS IN DIFFICULT AIRWAY

Since the first tracheal intubation under the guidance of direct laryngoscopy in 1895, many novel tools and techniques for airway control have come into clinical use. Some of them have been incorporated into routine airway control practice, while some others have found a place for conditions such as difficult ventilation or difficult intubation. While many supraglottic airway tools can be used when a difficult airway is encountered, the use of infraglottic airway tools has become preferred for the operations that require complete airway securing and that can only be performed under endotracheal intubation. These new airway equipment include constantly renewed rigid fiberoptic laryngoscopes, optic intubation stylets, fiberoptic bronchoscope, video laryngoscopes, gum elastic bougie, endotracheal tube guides (exchange catheters), and recently introduced ultrasonography (USG) (1,2,4,6,9,10).

New trends in the management of difficult airway are based on developing novel imaging techniques rather than promoting blind techniques. A better view of airway may perhaps change the definition of difficult intubation. Chronologically started with the advent of

different types of laryngoscopes, such trends continue today with many novel imaging techniques.

Rigid fiberoptic laryngoscopes are tools with specially designed blades carrying fiberoptic bundles; the Bullard type allows intubation with at least 6 mm mouth opening, while Upsher and Wu requires at least 15 mm mouth opening. Despite their advantages, laryngoscopes other than Wu laryngoscope have a limited clinical use due to their unsuitability for use in awake patients and enabling solely oral intubation. However, their use requires experience (2,11). TruView EVO₂, which is in use since 2000, has been preferred over other rigid fiberoptic laryngoscopes by virtue of its advantages of being safe both in patients with difficult airway and patients with cervical vertebral anomalies, and not requiring experience (2,12). On the other hand optic intubation stylets used in patients with limited mouth opening are not useful in case of a foreign material, hemorrhage, or tumor in airways and their use also requires experience (13). Today, flexible fiberoptic bronchoscopes are the gold standard for the management difficult airway since they allow oral or nasal intubation under both anesthesia and spontaneous respiration. Hagberg and Westhofen (14) reported that they were able to perform successful extubation and reintubation under the guidance of flexible fiberoptic laryngoscope in intensive care patients with known difficult airways. However, its cost and requirement of experience have led to efforts for developing new tools.

The advent of video laryngoscopes in 2000s enabling even the most difficult intubations with minimal effort has made a breakthrough (10,15). GlideScope designed by a Canadian surgeon was followed by GlideScope Ranger with curved tip blade enabling a better visualization of glottis, which in turn was followed by McGrath video laryngoscope with a video monitor screen (16). It has been reported that Grade III-IV views with the conventional Macintosh blades are visualized as Grade I by McGrath videolaryngoscopes, and intubation is achieved in the first attempt (17). Despite their overwhelming advantages, videolaryngoscopes could not enter routine anesthesiological practice owing to their substantial cost and some requiring attachment to a monitor for use. Development of video laryngoscopes such as Pentax airway scope-AWA-S 100 has provided a more ergonomic design; eye-camera-monitor incompatibility experienced by other videolaryngoscopes has been eliminated; and the cost of these tools has been reduced in the least by disposable or straight blade design. Modified types and different brands of these videolaryngoscopes continue to be manufactured (9,15,16). However, among various

videolaryngoscopes, only the low-cost, modified Airtraq scope has found a wide-scale use, and it is available in difficult airway sets of most clinics (18).

Gum elastic bougie, intubating laryngeal mask (ILMA), and C-Track LMA are still the current tools in the management of a difficult airway, especially difficult intubation. Combes et al (19) reported that ILMA and bougie enabled effective ventilation and intubation in all unexpected difficult airway cases. In case when we tell "I can see the cords but cannot introduce the tube" endotracheal tube guides enable intubation, a safe extubation and if necessary reintubation of difficultly intubated patients. In "Cannot ventilate, cannot intubate" situations, on the other hand, the combitube included in the ASA difficult airway algorithm is invaluable (7).

Despite the development of many safe tools and devices, their unavailability in difficult airway sets of most clinics because of high costs has made us rediscover available easy-to-practise techniques. The current trends are developed in the directions of technological advances. However, an ability of an anesthesiologist to perform difficult intubation using personal skills should be included in the curriculum. Novel techniques based on the modifications of laryngoscopy techniques and manual skills of anesthesiologists allows the management of a difficult intubation. It has been reported that an easier intubation is possible via obtaining better views with the left molar laryngoscopic approach first described by Yamamoto et al (20). A study in our clinic found a similar result, stating that the left molar laryngoscopic approach facilitated intubation in patients with unexpected difficult intubation and it may be an option until necessary preparations are made (1). Similarly, Gupta et al (21) reported that the left molar laryngoscopic approach was successful in both expected and unexpected difficult intubations, and it may be an alternative to Bonfils intubation fiberscope. In recent publication Biro and Ruetzler (22) reported successful intubation with a manually bended intubation tube during its introduction through the pharynx in a patient with difficult airway.

Anatomical structures can be safely evaluated and, at the same time, airway injuries and possible complications due to difficult intubation can be minimized and the localization of tracheal tube can be verified by USG, which is increasingly used for the management of a difficult airway (23). Invasive procedures such as difficult cricothyroidotomy have an important role in emergency situations; however, irregular anatomic surface of airways and blockage of adequate views by thyroid cartilage process are potential problems that can be overcome with increasing experience.

CONCLUSION

Thanks to many devices and techniques available today, management of a difficult airway has become relatively easier now. Mastering multiple techniques increases the odds for success although it requires experience. As one can see, the following questions await answers: Is the newest the best? Which is the easiest, the most practical and advantageous technique in the management of a difficult airway? Unfortunately, there is no exact answer to these questions.

Therefore, in case of a difficulty during airway management an anesthesiologist should prefer the method he or she is most experienced and familiar with; and should not refrain from seeking help.

REFERENCES

1. Bozdogan N, Sener M, Bilen A, Turkoz A, Donmez A, Arslan G. Does left molar approach to laryngoscopy make difficult intubation easier than the conventional midline approach? *Eur J Anaesthesiol* 2008; 25: 681-684.
2. Agrò FE, Cataldo R, Mattei A. New devices and techniques for airway management. *Minerva Anesthesiol* 2009; 75: 141-149.
3. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anaesthesia* 1984; 39: 1105-1111.
4. Ezri T, Szmuk P. Recent trends in tracheal intubation: emphasis on the difficult airway. *Curr Opin Anaesthesiol* 2004; 17: 487-490.
5. Cook TM, MacDougall-Davis SR. Complications and failure of airway management. *Br J Anaesth* 2012; 109: i68-85.
6. Huitink JM, Bouwman RA. The myth of the difficult airway: airway management revisited. *Anaesthesia* 2015; 70: 244-249.
7. Apfelbaum JL, Hagberg CA, Caplan RA, et al. American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology*. Practice guidelines for management of the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology* 2013; 118: 251-270.
8. Berkow LC. Strategies for airway management. *Best Pract Res Clin Anaesthesiol* 2004; 18: 531-548.
9. Gill RL, Jeffrey AS, McNarry AF, Liew GH. The Availability of Advanced Airway Equipment and Experience with Videolaryngoscopy in the UK: Two UK Surveys. *Anesthesiol Res Pract* 2015; 2015: 152014.
10. Yang KH, Jeong CH, Song KC, Song JY, Song JH, Byon HJ. Comparison between Glidescope and Lightwand for tracheal intubation in patients with a simulated difficult airway. *Korean J Anesthesiol* 2015; 68: 22-26.
11. Shirgoska B, Netkovski J. New techniques and devices for difficult airway management. *Acta Clin Croat* 2012; 51: 457-461.
12. Bhola R, Bhalla S, Gupta R, Singh I, Kumar S. Tracheal intubation in patients with cervical spine immobilization: A comparison of McGrath® video laryngoscope and Truview EVO2® laryngoscope. *Indian J Anaesth* 2014; 58: 269-274.
13. Evans A, Morris S, Petterson J, Hall JE. A comparison of the Seeing Optical Stylet and the gum elastic bougie in simulated difficult tracheal intubation: a manikin study. *Anaesthesiology* 2006; 61: 478-481.

14. Hagberg CA, Westhofen P. A two-person technique for fiberoptic-aided tracheal extubation/reintubation in intensive care unit (ICU) patients. *J Clin Anesth* 2003; 15: 467-470.
15. Niforopoulou P, Pantazopoulos I, Demestiha T, Koudouna E, Xanthos T. Video-laryngoscopes in the adult airway management: a topical review of the literature. *Acta Anaesthesiol Scand* 2010; 54: 1050-1061.
16. Healy DW, Maties O, Hovord D, Kheterpal S. A systematic review of the role of videolaryngoscopy in successful orotracheal intubation. *BMC Anesthesiology* 2012; 12, article 32.
17. Shippey B, Ray D, McKeown D. Use of the McGrath videolaryngoscope in the management of difficult and failed tracheal intubation. *Br J Anaesth* 2008; 100: 116-119.
18. Baciarello M, Zasa M, Manferdini ME, Tosi M, Berti M, Fanelli G. The learning curve for laryngoscopy: airtraq versus Macintosh laryngoscopes. *J Anesth* 2012; 26: 516-524.
19. Combes X, Le Roux B, Suen P, Dumerat M, Motamed C, Sauvat S, Duvaldestin P, Dhonneur G. Unanticipated difficult airway in anesthetized patients: prospective validation of a management algorithm. *Anesthesiology* 2004; 100: 1146-1150 .
20. Yamamoto K, Tsubokawa T, Ohmura S, Itoh H, Kobayashi T. Left-molar approach improves the laryngeal view in patients with difficult laryngoscopy. *Anesthesiology* 2000; 92: 70-74.
21. Gupta A, Thukral S, Lakra A, Kumar S. A comparison between left molar direct laryngoscopy and the use of a Bonfils intubation fibroscope for tracheal intubation in a simulated difficult airway. *Can J Anaesth* 2015; 62: 609-617.
22. Biro P, Ruetzler K. The reflective intubation manoeuvre increases success rate in moderately difficult direct laryngoscopy: A prospective case-control study. *Eur J Anaesthesiol* 2015; 32: 406-410.
23. Kundra P, Mishra SK, Ramesh A. Ultrasound of the airway. *Indian J Anaesth* 2011; 55: 456-462.