

6. Shoemaker WC, Appel PL, Kram HB, Waxman K, Lee TS: Prospective trial of supranormal values of survivors as therapeutic goals in high-risk surgical patients. *Chest* 1988; 94: 1176-86
7. Kehlet H, Bundgaard-Nielsen M: Goal-directed perioperative fluid management: Why, when, and how? *ANESTHESIOLOGY* 2009; 110:453-5
8. Buettner M, Schummer W, Huettemann E, Schenke S, van Hout N, Sakka SG: Influence of systolic-pressure-variation-guided intraoperative fluid management on organ function and oxygen transport. *Br J Anaesth* 2008; 101:194-9
9. Iglesias M, Jungebluth P, Petit C, Matute MP, Rovira I, Martínez E, Catalan M, Ramirez J, Macchiarini P: Extracorporeal lung membrane provides better lung protection than conventional treatment for severe postpneumectomy noncardiogenic acute respiratory distress syndrome. *J Thorac Cardiovasc Surg* 2008; 135:1362-71
10. Moutafis M, Liu N, Dalibon N, Kuhlman G, Ducros L, Castelain MH, Fischler M: The effects of inhaled nitric oxide and its combination with intravenous almitrine on Pao<sub>2</sub> during one-lung ventilation in patients undergoing thoracoscopic procedures. *Anesth Analg* 1997; 85:1130-5
11. Rocca GD, Passariello M, Coccia C, Costa MG, Di Marco P, Venuta F, Rendina EA, Pietropaoli P: Inhaled nitric oxide administration during one-lung ventilation in patients undergoing thoracic surgery. *J Cardiothorac Vasc Anesth* 2001; 15:218-23
12. Inomata S, Nishikawa T, Saito S, Kihara S: "Best" PEEP during one-lung ventilation. *Br J Anaesth* 1997; 78:754-6
13. Michelet P, Roch A, Brousse D, D'Journo XB, Bregeon F, Lambert D, Perrin G, Papazian L, Thomas P, Carpentier JP, Auffray JP: Effects of PEEP on oxygenation and respiratory mechanics during one-lung ventilation. *Br J Anaesth* 2005; 95:267-73

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## Management of Unanticipated Difficult Airway in the Prehospital Emergency Setting

To the Editor:

We were greatly interested in the recent article of Combes *et al.*<sup>1</sup> that prospectively validated a prehospital difficult-intubation algorithm. In this clinical study, the tracheal intubation with direct laryngoscope proved impossible in 160 patients. However, of these 160 patients, 15 had a laryngeal view of the Cormack and Lehane (C&L) class I or II, which is generally regarded as an easy laryngoscopy.<sup>2</sup> The ease of direct laryngoscopy is not synonymous with ease of tracheal intubation, but the laryngeal view obtained by direct laryngoscopy usually is an important determinant of successful intubation. We would like to know the detailed cause of failed intubation in these patients with an easy laryngoscopy. Moreover, the authors did not clearly describe whether their algorithm required for use of an endotracheal tube with a malleable stylet at the initial intubation attempt. In managing difficult intubation, mounting the endotracheal tube onto a stylet and angling the distal tip upward help to guide the tube tip toward the glottis and improve the success rate of tracheal intubation.<sup>3</sup> This measure is especially useful when a poor laryngeal view is obtained during direct laryngoscopy or

when using a flexible endotracheal tube without a natural anterior curve. In general, when speed of tracheal intubation is important (as in a patient with a full stomach or chest compression), an endotracheal tube should always be equipped with a stylet.<sup>4</sup>

In this difficult-intubation management algorithm, the authors recommended that if the tracheal intubation failed after either two attempts with a C&L class less than IV or a single attempt with a C&L class IV, along with optimal upper airway and head manipulations, the participants were requested to move to the next step of the algorithm, the gum elastic bougie (GEB). GEB-guided intubation was used as first choice and the intubating laryngeal mask airway (ILMA) as a backup. However, what usually determines the successful intubation with the GEB is part or complete visualization of the epiglottis with or without laryngeal structure. For an intubator who has no extensive experience in the GEB-guided intubation, if direct laryngoscopy can not expose any epiglottic structure as an objective mark (*e.g.*, C&L class IV), blindly inserting the GEB into the trachea will be very difficult. In clinical practice, the GEB-guided intubation is really most suitable for patients with a C&L class less than IV.<sup>5</sup> Thus, we consider that in their difficult-intubation management algorithm, the rescue step to use the GEB-guided intubation as first choice may be suitable only for the patients with a C&L class less than IV. After a single intubation attempt failed in patients with a C&L class IV, the rescue airway algorithm should move directly to the step that uses the ILMA to ventilate the patients and then to intubate the trachea, but not to the step that attempts reintubation with the GEB because it has high risks of failed intubation and increased airway trauma. For this situation, we completely agree with the editorial view of Drs. Isono and Ishikawa that maintenance of oxygenation is the final goal of airway management.<sup>6</sup>

The authors did not clearly state the type of the ILMA used for this difficult-intubation management algorithm. When an ILMA is used as a rescue airway device in the prehospital setting, we recommend use of the ILMA CTrach™ (Laryngeal Mask Company Limited, San Diego, CA) with the integrated fiberoptic channels and a detachable liquid crystal display viewer, rather than the ILMA Fastrach™ (Laryngeal Mask Company Limited). It has been shown that compared with the ILMA Fastrach™, the ILMA CTrach™ can enable a higher first-attempt success rate of tracheal intubation because of the view of the glottis it provides, the way it optimizes placement of the device, and the ability to observe the process of tracheal intubation through the device.<sup>7</sup> In addition, data from the study of Nickel *et al.*<sup>8</sup> suggest that the ILMA CTrach™ is a suitable device for emergency airway management in the prehospital setting because it provides ventilation and facilitates intubation with a very high success rate.

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## References

1. Combes X, Jabre P, Margenet A, Merle JC, Leroux B, Dru M, Lecarpentier E, Dhonneur G: Unanticipated difficult airway man-

- agement in the prehospital emergency setting: Prospective validation of an algorithm. *ANESTHESIOLOGY* 2011; 114:105-10
- Xue FS, Wang XL: Definition, causes and management principles of difficult airway. *Modern Airway Management: A Key Technique for Clinical Anesthesia and Critical Care Medicine*. Edited by Xue FS. Zhengzhou, China, Zhengzhou University Publishing House, 2002, pp 723-34
  - Xue FS, Liao X, Li CW, Xu YC, Yang QY, Liu Y, Liu JH, Luo MP, Zhang YM: Clinical experience of airway management and tracheal intubation under general anesthesia in patients with scar contracture of the neck. *Chin Med J* 2008; 121:989-97
  - Berry JM: Conventional (laryngoscopic) orotracheal and nasotracheal intubation (single-lumen tube), Benumof's Airway Management: Principles and Practice, 2nd edition. Edited by Hagberg CA. St. Louis, Mosby, 2007, pp 388
  - Jabre P, Combes X, Leroux B, Aaron E, Auger H, Margenet A, Dhonneur G: Use of gum elastic bougie for prehospital difficult intubation. *Am J Emerg Med* 2005; 23:552-5
  - Isono S, Ishikawa T: Oxygenation, not intubation, does matter. *ANESTHESIOLOGY* 2011; 114:7-9
  - Liu EH, Goy RW, Lim Y, Chen FG: Success of tracheal intubation with intubating laryngeal mask airways: A randomized trial of the LMA Fastrach™ and LMA CTrach™. *ANESTHESIOLOGY* 2008; 108:621-6
  - Nickel EA, Timmermann A, Roessler M, Cremer S, Russo SG: Out-of-hospital airway management with the LMA CTrach—a prospective evaluation. *Resuscitation* 2008; 79:212-8

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#### In Reply:

We thank very much Xue *et al.*, for their interesting letter concerning our recently published article in *ANESTHESIOLOGY*.<sup>1</sup> The remarks and questions are important and need some clarifications. Concerning the patients with Cormack and Lehane class I or II, it is right that most often these patients are, and were in our series, easy to intubate. But sometimes, as outlined by Xue *et al.*, the ease of direct laryngoscopy is not synonymous with ease of tracheal intubation. We encountered a difficult intubation in only 15 patients without any specific causes for their initial intubation failure.

Concerning the use of a stylet, our algorithm did not require the use of this device. We think that the gum elastic bougie (GEB) is more efficient and less traumatic than a stylet. We do not totally agree with Xue *et al.* that when the speed of tracheal intubation is important, a stylet should always be used. To our knowledge, no high-evidence-level studies support this statement. In the few studies that compared the stylet to the GEB, the GEB was more efficient and allowed intubation with a shorter time than did the stylet in difficult intubations.<sup>2,3</sup>

It is right that GEB is classically indicated only when the Cormack and Lehane class of laryngeal view is less than IV. However, we have already reported the potential interest of using GEB in patients with Cormack and Lehane class IV with a high intubation success rate.<sup>4</sup>

In our study, we used the reusable form of intubating Laryngeal Mask Airway (LMA) Fastrach™ (Laryngeal Mask Company Limited, San Diego, CA), not the intubating LMA CTrach™. We agree with Xue *et al.* that the intubat-

ing LMA CTrach™ is an excellent device and could have been used in our algorithm as a substitute for the intubating LMA Fastrach™. However, it has been reported that intubation through the intubating LMA CTrach™ needs more time than does intubation using the intubating LMA Fastrach™.<sup>5</sup> Moreover, the cost effectiveness of the intubating LMA CTrach™ is questionable when compared with that of the intubating LMA Fastrach™.<sup>5</sup>

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#### References

- Combes X, Jabre P, Margenet A, Merle JC, Leroux B, Dru M, Lecarpentier E, Dhonneur G: Unanticipated difficult airway management in the prehospital emergency setting: Prospective validation of an algorithm. *ANESTHESIOLOGY* 2011; 114: 105-10
- Noguchi T, Koga K, Shiga Y, Shigematsu A: The gum elastic bougie eases tracheal intubation while applying cricoid pressure compared to a stylet. *Can J Anaesth* 2003; 50:712-7
- Gataure PS, Vaughan RS, Latto IP: Simulated difficult intubation. Comparison of the gum elastic bougie and the stylet. *Anaesthesia* 1996; 51:35-8
- Combes X, Dumerat M, Dhonneur G: Emergency gum elastic bougie-assisted tracheal intubation in four patients with upper airway distortion. *Can J Anaesth* 2004; 51:1022-4
- Liu EH, Goy RW, Lim Y, Chen FG: Success of tracheal intubation with intubating laryngeal mask airways: A randomized trial of the LMA Fastrach™ and LMA CTrach™. *ANESTHESIOLOGY* 2008; 108:621-6

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## A Modified Difficult Airway Management Algorithm Incorporating Video Devices in Routine Anesthesia Practice

#### To the Editor:

The recent article of Amathieu *et al.*<sup>1</sup> that prospectively validated a modified difficult airway management algorithm incorporating video devices in routine anesthesia practice was of great interest to us. The authors should be congratulated for their excellent works in such a large cohort of anesthetized, paralyzed patients. However, there are several aspects of this study that should be clarified and discussed. We believe that such information would be helpful for others who would like to try this modified difficult airway management algorithm.

First, because authors did not provide the method of anesthesia induction used in this study, it was not clear whether the spontaneous breathing ceased when assessing facemask ventilation (FMV) before giving muscle relaxant in all patients with fewer than three adverse predictors. Moreover, if the amount of anesthetic is inadequate, airway spasm, a common cause of difficult FMV, can occur in response to irritation of the epiglottis and glottis from oropharyngeal or na-