



# Need to prepare our best shot for airway management in emergency department: when the going gets tough, the tough get going

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Difficult airway management and difficult intubation can be challenging in any setting but are especially so in the pre-hospital (1), emergency department and intensive care environments. Over the last few decades, a number of devices have been introduced into clinical practice to deal with this challenge. However, very few devices have withstood the test of time better than tracheal tube introducer (bougies).

Airway management outside operating room environment is more challenging as the standard airway assessment may not be possible, intubation delays and multiple attempts more likely and the risks of peri-intubation hypoxemia and death are increased (2). In such circumstances, first-attempt intubation success is of paramount importance (3).

Since the first introduction of the gum elastic bougie by Sir Macintosh, bougies (or tracheal introducers) gained their role in many international guidelines for difficult intubation (4), with recent extension of their use for emergency front of neck access (5), safe extubation (6) or even for intubation through supraglottic devices (7). Many papers have been exploring the role of in emergency (8,9), and recently, a large randomized controlled trial conducted in a level trauma centre in Minneapolis, USA, was published in *JAMA* (10). This study looked at the first-attempt intubation success in patients with difficult airways undergoing emergency intubation. Driver *et al.* showed that using a bougie with a Macintosh blade for intubation in emergency department resulted in a 98% first-attempt success compared with an 87% rate for Macintosh used

with a styletted endotracheal tube. This success rate was slightly lower amongst patients with difficult airway, 96% and 82% respectively, but widening the success gap between bougie and stylet. A closer reading of Driver's data, shows that in specific subgroups (such as manual in line cervical stabilization), exploratory analysis indicated even wider success rate gap—100% *vs.* 78% in favour of bougie.

Driver's paper highlighted number of issues related to the bougie use. They concluded that in the emergency department setting, there is clear benefit in using bougie as a primary intubation device. This is explained by the bougie's smaller diameter than tracheal tube, making glottis visualisation easier and by the more accurate advance towards opening of the glottis when faced with crowded upper airway and/or limited view of the glottis during laryngoscopy. There was slight difference (95% CI) in the overall first-attempt duration, which may be considered not to have any clinical relevance, but is likely to be due to the two-step nature of bougie aided intubation (bougie insertion, tube loading and railroading). So more time-consuming, bougie guided intubation resulted in higher first pass success with a lower number of patients with desaturation (SpO<sub>2</sub> less than 90% or less than 10% of baseline) when compared to stylet: 15% *vs.* 23%, respectively. Once again, this gap increased in patients with difficult airways, with 18% for bougie and 31% for stylet. Furthermore, in 7% of patients randomised to stylet intubation, the physician broke the protocol choosing bougie for intubation, based on assessment of a perceived

airway management difficulty or the need for a fast airway control.

Similarly, Aziz and co-workers (11) conducted a large multicentre study where they found that video laryngoscopy was associated with a highest rescue intubation success rate and was the most commonly chosen rescue technique when direct laryngoscopy failed. Nevertheless, in up to 8% of cases also video laryngoscope failed, and intubation was performed using fiberoptic intubation in 33% of cases or in 30% of cases stepping back to Macintosh laryngoscope, which was successfully coupled with a bougie in almost half of interventions. Aziz' and Driver's findings suggest that we are probably underestimating the usefulness of this simple to use, inexpensive device even at the time of great technological advances in airway management such as video laryngoscopy. These findings represent a strong call to encourage bougie adoption in difficult airway trolleys and to promote their teaching and educated use.

In Driver's study participants opted not to shape the bougie in majority of intubations. Evidence seem to suggest that when faced with limited view at laryngoscopy bending the bougie to correspond to the shape of the airway is more likely to lead to success (12). High success rate in Driver's study with straight bougie may be explained with a very wide definition of difficult airway and with a finding that on laryngoscopy, either direct and indirect, grade 3 or 4 view were experienced in only 15% of cases in the bougie group. The issue of bending introducers is still under debate and reflects mostly individual preferences (13) or use with hyper-angulated blades video laryngoscopes (14). Looking at Driver's study data, the screen of a video-enabled Macintosh was used in only 50% of cases and not always thorough the all procedure; this finding might be interpreted as if use of bougies might also lower the need to obtain a "better view" as when using a video-enhanced opportunity for laryngoscopy. On the other hand, 41% of patients in the study required the video screen of the C-Mac video laryngoscope to guide the bougie placement or for the entire attempt. There seems to be a clear benefit in coupling the use of a bougie and video laryngoscope. This is supported with other studies suggesting that intubation success and time to intubation is enhanced in elective and emergency setting if bougie is concurrently used to aid tube placement (15), including a high first-attempt success rate in pre-hospital setting (9). The benefits of concurrent bougie use during video laryngoscope guided intubation are likely to be present with hyperangulated (14) and channelled (16) video laryngoscope blades, and a further benefit of

combined use is found in the reduced incidence of airway trauma associated with bougie use. Recent observational study of 543 intubations found the incidence of Frova bougie induced airway trauma to be 0.8% (8), which is considerably smaller to a reported 5.5% incidence of airway trauma reported with Macintosh laryngoscope (17).

The Driver study reported low incidence of complications associated with bougie use: 13% were observed for bougie and 14% with stylet, whereas oesophageal intubation was reported in 3 cases (1%) in the stylet group only. Resistance or impingement during tube railroading was reported in 7% of cases but easily resolved with 90° anticlockwise tube rotation (18). Signs used to confirm tracheal placement of the bougie were used in majority of patients—clicks were elicited in 91% of cases, and hold-up sign, in 64% of cases. Although the use of a hold-up sign was not recommended by the study protocol due to airway trauma potential (19,20), it was still used in a large proportion of patients. Emergency intubations are likely to be stressful, so we might expect that a certain number of elicited hold-up signs were unintentional, due to a coincidental deep bougie insertion. Nevertheless, a certain number must have been intentional. Although Driver *et al.* reported low incidence of bougie-related airway trauma, caution should be exercised when this sign is elicited, especially when stiffer single use bougies are used to aid tube placement (19).

The main conclusion of the Driver's paper sounds strong and supports changes to the current airway management in emergency department: "*the bougie might be beneficial as primary intubation device rather than solely as a rescue adjunct*" (10). We fully support this recommendation as when the goings get tough, it is important to have our first attempt most likely to succeed.

Driver's paper main limitation is probably that the study was single-centred, with a population of emergency physicians and senior emergency medicine residents well trained and experienced in the use of bougie (10). Their results might reflect not only such a training and experience, but also a great teamwork and a perfectly working and extensively burnished emergency-machine, as the careful reader could notice that about 60% of patients in Driver's study received apnoeic oxygenation during airway instrumentation (so-called NODESAT) (21), suggesting this approach is common and almost standardized. So, on one hand, bougie is highly effective, ease to use and inexpensive device that despite being around for more than 50 years, still has an essential role to play in difficult airway management. On the other hand, we should all work

towards re-emphasising bougie use training as educated use of this device is needed increase performance and to avoid bougie induced airway trauma. Nevertheless, waiting what we might call the bougie transition, it should be remembered that patients die because of lack of oxygen, so any strategy designed to tackle technical and non-technical issues should be performed in light of this fundamental perspective (22).

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## Footnote

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## References

1. Crewdson K, Rehn M, Lockey D. Airway management in pre-hospital critical care: a review of the evidence for a 'top five' research priority. *Scand J Trauma Resusc Emerg Med* 2018;26:89.
2. Martin LD, Mhyre JM, Shanks AM, et al. 3,423 emergency tracheal intubations at a university hospital: airway outcomes and complications. *Anesthesiology* 2011;114:42-8.
3. Sakles JC, Chiu S, Mosier J, et al. The importance of first pass success when performing orotracheal intubation in the emergency department. *Acad Emerg Med* 2013;20:71-8.
4. Frova G, Sorbello M. Algorithms for difficult airway management: a review. *Minerva Anesthesiol* 2009;75:201-9.
5. Onrubia X, Frova G, Sorbello M. Front of neck access to the airway: A narrative review. *Curr Anaesth Crit Care* 2018;22:45-55.
6. Sorbello M, Frova G. When the end is really the end? The extubation in the difficult airway patient. *Minerva Anesthesiol* 2013;79:194-9.
7. Sorbello M, Petrini F. Supraglottic Airway Devices: the Search for the Best Insertion Technique or the Time to Change Our Point of View? *Turk J Anaesthesiol Reanim* 2017;45:76-82.
8. Grape S, Schoettker P. The role of tracheal tube introducers and stylets in current airway management. *J Clin Monit Comput* 2017;31:531-7.
9. Ångerman S, Kirves H, Nurmi J. A before-and-after observational study of a protocol for use of the C-MAC videolaryngoscope with a Frova introducer in pre-hospital rapid sequence intubation. *Anaesthesia* 2018;73:348-55.
10. Driver BE, Prekker ME, Klein LR, et al. Effect of Use of a Bougie vs Endotracheal Tube and Stylet on First-Attempt Intubation Success Among Patients With Difficult Airways Undergoing Emergency Intubation: A Randomized Clinical Trial. *JAMA* 2018;319:2179-89.
11. Aziz MF, Brambrink AM, Healy DW, et al. Success of Intubation Rescue Techniques after Failed Direct Laryngoscopy in Adults: A Retrospective Comparative Analysis from the Multicenter Perioperative Outcomes Group. *Anesthesiology* 2016;125:656-66.
12. Hodzovic I, Wilkes AR, Latto IP. To shape or not to shape...simulated bougie-assisted difficult intubation in a manikin. *Anaesthesia* 2003;58:792-7.
13. Sorbello M, Frova G. Frova introducer: neither a stylet nor simply an introducer. *Anaesthesia* 2008;63:1010-1; author reply 1011-3.
14. Sorbello M, Hodzovic I. Optimising Glidescope performance. *Anaesthesia* 2017;72:1039-40.
15. Aziz MF, Dillman D, Fu R, et al. Comparative effectiveness of the C-MAC video laryngoscope versus direct laryngoscopy in the setting of the predicted difficult airway. *Anesthesiology* 2012;116:629-36.
16. Matsuyama K, Shibata M, Fujinaka W, et al. Effectiveness of gum elastic bougie for tracheal intubation with Airtraq optical laryngoscope. *Masui* 2012;61:64-7.
17. Hodzovic I, Wilkes AR, Stacey M, et al. Evaluation of clinical effectiveness of the Frova single-use tracheal tube introducer. *Anaesthesia* 2008;63:189-94.
18. Dogra S, Falconer R, Latto IP. Successful difficult intubation. Tracheal tube placement over a gum-elastic bougie. *Anaesthesia* 1990;45:774-6.
19. Marson BA, Anderson E, Wilkes AR, et al. Bougie-related airway trauma: dangers of the hold-up sign. *Anaesthesia* 2014;69:219-23.
20. Umesh G, Jasvinder K. Frova introducer for tracheal intubation - our comments and experience. *Anaesthesia* 2008;63:1260-1; author reply 1261-2.
21. Grude O, Solli HJ, Andersen C, et al. Effect of nasal or nasopharyngeal apneic oxygenation on desaturation during

induction of anesthesia and endotracheal intubation in the operating room: A narrative review of randomized controlled trials. *J Clin Anesth* 2018;51:1-7.

22. Sorbello M, Afshari A, De Hert S. Device or target?

A paradigm shift in airway management: Implications for guidelines, clinical practice and teaching. *Eur J Anaesthesiol* 2018;35:811-4.

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