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SCIENTIFIC LETTER

Improving fiberoptic intubation in the conscious patient using the new Janus mask

Mejora del procedimiento de intubación con fibra óptica y paciente despierto con la nueva máscara Janus

Dear Editor,

Fiberoptic intubation is a mainstay of predicted difficult airway management and still represents the gold standard in this clinical setting.[1] The acquisition of basic skills and the improvement of dexterity in this setting may be based on clinical practice (e.g. fiberoptic intubation in ordinary airway management), simulation on mannequins, virtual bronchoscopy software, and with the inexpensive Gil 5-Minute Dexterity Model.[2]

However, some issues may arise during fiberoptic intubation even for the most trained anesthesiologists in the setting of cardiorespiratory comorbidity determining hypoxemia and need for respiratory support during the procedure.

Janus mask (Biomedical S.r.l., Florence, Italy) is a novel full-face mask designed to provide continuous positive airway pressure (CPAP) that allows to perform different endoscopic techniques such as transesophageal echocardiography, upper digestive endoscopy, and fiberoptic bronchoscopy.[3,4] This mask, indeed, is made up of two separable halves with a midline port that allows the insertion of endoscopic probes into patient's mouth or nose for diagnostic and/or therapeutic aims without interrupting the CPAP support. For this reason, it can be placed on and/or removed from patient's face even when the endoscopic examination is ongoing.

The unique features of this device may be, in our opinion, extremely useful in the management of a difficult intubation scenario.

Therefore, we started to use it in this context and we report our experience with the first two patients treated. Both patients signed an informed consent for management and publication of data and images.

Case 1

A 77-year-old woman was scheduled for aortic valve replacement because of severe aortic stenosis and the preoperative anesthesiological evaluation was suggestive for a possible difficult airway, as the patient was overweight (BMI 31.2 kg/m^2), presented a Mallampati score of 3, a thyromental distance of 2.5 cm, and mouth opening was 3 cm. Furthermore, she referred history of difficult endotracheal intubation during two previous surgeries.

We planned elective intubation under fiberoptic guide and we administrated midazolam 5 mg i.v. to reduce patient's anxiety and discomfort associated with awake intubation under fiberoptic guidance, and to maintain at the same time spontaneous breathing and collaboration for simple commands, such as coughing and breathing.

Baseline SpO2 was 97% in room air, and respiratory rate was 16 breaths/min.

We delivered CPAP (PEEP 5 cmH_2O) plus a pressure support of 10 cmH_2O through the new full-face ''Janus'' mask in order to support ventilation and maintain oxygenation.

After obtaining an Observer's Assessment of Alertness/Sedation scale score of 4 (lethargic response to name spoken in normal tone),[5] an inexperienced anesthesiologist under expert supervision performed the procedure inserting the fiberoptic probe together with the endotracheal tube through the Janus mask central port into patient's mouth. The procedure was successful and uneventful, but required three attempts and lasted 12 min.

The Janus mask was then removed simply separating its two halves, without compromising in any way the correct position and depth of the endotracheal tube. We then administered fentanyl (250 mcg), propofol (150 mg) and rocuronium (50 mg), and set the mechanical ventilation for volume control continuous mechanical ventilation. Anesthesiological management and surgery were performed as usual and no complications were recorded. The procedure is also shown as a video in the supplementary material.

Case 2

Two weeks later we treated another patient, a 69 year-old woman scheduled for thoracoabdominal aortic aneurysm

repair surgery, with the same approach. On physical examination, the patient was overweight (BMI 33 kg/m^2) and displayed a Mallampati score of 3, an interincisive distance of 4 cm, loose inferior incisors, mandibular prognathism, and a reduced cervical spine range of motion. We programmed a Janus mask-aided elective awake fiberoptic intubation to manage this predicted difficult airway scenario. Baseline SpO2 was 98% in room air, and respiratory rate was 15 acts/min.

The patient received topical lidocaine, i.v. midazolam 2 mg to reduce the discomfort associated with the procedure, and CPAP ventilation was started. An expert anesthesiologist performed the procedure in 5 min. After the orotracheal intubation was successfully accomplished and confirmed, we induced general anesthesia with propofol i.v. 100 mg, fentanyl 150 mcg i.v., rocuronium 40 mg i.v. The surgical operation was performed as planned.

We reported a new strategy to approach one of the worst scenarios that anesthesiologists may face, that is to say, the ''planned difficult intubation'' situation. Such strategy can also be extended to all the intensive care unit (ICU) patients and all acute critically ill patients, who are not intubated, need to undergo endoscopic procedures (fibroscopy, transesophageal echocardiography, etc.), and present nevertheless a reduced respiratory reserve or respiratory failure.[6,7] In critically ill patients the intubation maneuver is hazardous due to factors related to the patients (hemodynamic instability, decreased oxygen and physiologic reserve, full stomach, coagulopathy, low platelet count, anticoagulants) and factors associated to the setting itself (inability of head extension, environment, attending physicians with variable levels of expertise in difficult intubation). Therefore the incidence of difficult intubation and the severity of desaturation is higher in ICU compared to the operating room.[8] As a more profound desaturation is associated with higher risk of cardiac arrest,[9] devices able to ''gain time'' during challenging intubation may improve outcome.

Janus mask applied during difficult airway management can significantly improve both pre-oxygenation and oxygenation during fibroscopic intubation maintaining an adequate oxygen saturation even in the event of prolonged or complex maneuvers. Although the pre-oxygenation is essential to avoid desaturation in the operating room, several authors have shown that it is not effective in ICU patients due to the coexistence of pulmonary and cardiac diseases, anemia, low cardiac output syndrome, sepsis, ventilation/perfusion mismatch, acute respiratory distress syndrome, pathologic states associated with increased consumption of oxygen.[10,11] The rationale of the use of the Janus mask is supported also by the data from Miguel-Montanes,[12] who observed a higher saturation at the end of pre-oxygenation in critical ill patients with mild to moderate respiratory failure with the use of a high flow nasal cannula oxygen (HFNO) compared to a non-rebreathing facemask. Several differences between HFNO and Janus mask have to be addressed: first, HFNO improves oxygenation ''washing out'' the pharyngeal deadspace with high oxygen concentration and a modest PEEP effect, while with Janus mask can be adopted increasing the end expiratory lung volume. Then, HFNO was not superior to facemask in improving oxygenation in patient with severe hypoxia who needed intubation,[13] while Janus mask maintained an adequate oxygenation in fragile patients undergoing prolonged TEE for appendage closure, procedure which required more than an hour. Finally, although there is no experience with HFNO and fibroscopy in the context of difficult intubation, the possibility to perform the CPAP with Janus mask may maintain a better gas exchange during the entire procedure.

For all the reasons mentioned above we believe that the critical ill patients who may benefit from the use of this device are several in everyday clinical intensive care practice.

In addiction, the Janus mask may have a role in the training of junior colleagues with endoscopic maneuvers, as it supports ventilation and maintain oxygenation during the procedure. Therefore, long maneuvers can be tolerated, avoiding desaturation episodes.

We are aware that nowadays many simulation technologies are available and allow the acquisition of basic skills about fiberoptic intubation in a safe non-clinical scenario. However, the simulation is not fully representative of the real clinical life, which is often more complicated and stressful.

Furthermore, the Janus mask can be applied also during the endoscopy in case of oversedation or respiratory worsening of the patient, as it can be opened and then closed around the probe.

Other strategies do exist to perform intubation in a planned or unplanned difficult airway scenario and were reported in literature: overall, they involve the use of existing devices (laryngeal mask, videolaringoscopes, etc.) or tracheal puncture.[14–18]

Teteura and colleagues, for example, sperimented successfully Intubation Using a Double-lumen Tube with a Combination of Fiberoptic Bronchoscope and the Glidescope in a Patient with difficult airway,[14] but this technique required the contemporary presence of 4 anesthesiologists, which is not generally possible in routine clinical practice (especially if the difficult airway situation is unexpected).

Furthermore, intubation with a videolaryngoscope requires a deep level of sedation, and eventually the administration of a neuromuscular blocking agents. Our strategy, on the contrary, can be performed also without curarization and with a mild/moderate level of sedation.

The I-gel laryngeal mask also proved to be a useful tool, when used in combination with a lightwand[15] or the Aintree intubation catheter.[16]

Tracheal puncture at the level of the chricothyroid membrane to perform retrograde intubation[17] and the use of a tracheal introducer[18] were also reported as useful strategies in this context, but they are highly invasive.

In our opinion the use of such invasive approaches cannot be encouraged, now that modern, non-invasive, and safe devices such as the Janus mask are available. Furthermore, none of the previously reported strategies is able to support the spontaneous ventilation with a positive pressure during intubation maneuver.

In conclusion, we believe that the Janus mask may have an extraordinary potential in clinical practice. In particular, the use of this device has a strong rational as a bridge to awake fiberoptic intubation, as a rescue ventilator therapy during interventional procedures, and as an educational

tool for the anesthesiologists without experience in fiberoptic intubation, who can improve their confidence with this procedure in a safe real life scenario.

Contribution of the authors

MP: collection, analysis and interpretation of data, writing of the manuscript and final revision.

SS: study design, collection of data, writing of the manuscript and final revision.

CVD: study design, collection of data, writing of the manuscript and final revision.

GF: collection, analysis and interpretation of data, final revision of the manuscript.

AO: analysis and interpretation of data, final revision of the manuscript.

AZ: study design, collection and interpretation of data, final revision of the manuscript.

FM: study design, collection, analysis and interpretation of data, final revision of the manuscript.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.medin.2017.01.004

References

1. Frova G, Sorbello M. Algorithms for difficult airway management: a review. Minerva Anestesiol. 2009;75:201–9.
2. Gil KS. Fiber-optic intubation: tips from the ASA Workshop. Anesthesiol News. 2009;35:91–8.
3. Zangrillo A, Mazzone P, Votta CD, Villari N, Della Bella P, Monaco F. Prolonged transesophageal echocardiography during percutaneous closure of the left atrial appendage without general anesthesia: the utility of the Janus mask. Can J Anaesth. 2016;63:962–5.
4. Cabrini L, Landoni G. A novel non-invasive ventilation mask to prevent and manage respiratory failure during fiberoptic bronchoscopy, gastroscopy and transesophageal echocardiography. Heart Lung Vessel. 2015;7:297–303.
5. Chernik DA, Gillings D, Laine H, et al. Validity and reliability of the Observer's Assessment of Alertness/Sedation Scale: study with intravenous midazolam. J Clin Psychopharmacol. 1990;10:244–51.
6. Bove T, Votta CD, Ciriaco P, Pappalardo F, Oriani A, Frau G, Zangrillo A. Bronchoscopy during non-invasive ventilation in a patient with acute respiratory distress syndrome. Signa Vitae. 2017, in press.
7. Cabrini L, Savia I, Bevilacqua M, Votta CD, Filippini M, Landoni G, et al. Continuous positive airway pressure during upper endoscopies: a bench-study on a novel device. J Cardiothorac Vasc Anesth. 2016;30:e43–5.
8. Ricard JD. Hazards of intubation in the ICU: role of nasal high flow oxygen therapy for preoxygenation and apneic oxygenation to prevent desaturation. Minerva Anestesiol. 2016;82:1098–106.
9. Mort TC. The incidence and risk factors for cardiac arrest during emergency tracheal intubation: a justification for incorporating the ASA Guidelines in the remote location. J Clin Anesth. 2004;16:508–16.
10. Mort TC, Waberski BH, Clive J. Extending the preoxygenation period from 4 to 8 min in critically ill patients undergoing emergency intubation. Crit Care Med. 2009;37:68–71.
11. Baillard C, Fosse JP, Sebbane M, Chanques G, Vincent F, Courouble P, et al. Noninvasive ventilation improves preoxygenation before intubation of hypoxic patients. Am J Respir Crit Care Med. 2006;174:171–7.
12. Miguel-Montanes R, Hajage D, Messika J, Bertrand F, Gaudry S, Rafat C, et al. Use of high-flow nasal cannula oxygen therapy to prevent desaturation during tracheal intubation of intensive care patients with mild-to-moderate hypoxemia. Crit Care Med. 2015;43:574–83.
13. Vourc'h M, Asfar P, Volteau C, Bachoumas K, Clavieras N, Egreteau PY, et al. High-flow nasal cannula oxygen during endotracheal intubation in hypoxemic patients: a randomized controlled clinical trial. Intensive Care Med. 2015;41:1538–48.
14. Tateura N, Sato H, Arai T, et al. Intubation using a double-lumen tube with a combination of fiberoptic bronchoscope and the glidescope in a patient with difficult airway. Masui. 2015;64:815–8.
15. Choi CG, Yang KH, Jung JK, et al. Endotracheal intubation using i-gel® and lightwand in a patient with difficult airway: a case report. Korean J Anesthesiol. 2015;68:501–4.
16. Hashimoto Y, Takahashi K, Saito T, et al. Tracheal intubation via the i-gel and the aintree intubation catheter in a patient with unexpected difficult intubation. Masui. 2015;64:534–6.
17. Miner JR, Rubin J, Clark J, et al. Retrograde intubation with an extraglottic device in place. J Emerg Med. 2015;49:864–7.
18. Pirotte M, Pirotte A, Trueger NS. Digitally assisted bougie intubation: a novel technique for difficult airway management. Am J Emerg Med. 2015;33:e3–4.

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