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CLINICAL INFORMATION

Use of a homemade introducer guide (bougie) for intubation in emergency situation in patients who present with difficult airway: a case series

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Abstract

Background and objectives: The incidence of difficult airway reaches 10% of emergency intubations. Although few studies address the use of handmade introducer guides in emergency and intensive care environment, there are descriptions of handmade guides available on the Internet. We describe a case series on the use of a handmade introducer guide (bougie) for emergency intubation in patients with difficult airway.

Case report: The handmade introducer guide was used in five consecutive patients with difficult airways, and clinical instability and in the absence of another immediate method to obtain an airway. This technique provided successful intubation and there were no complications.

Conclusions: The use of the handmade introducer guide can be a useful option for the management of difficult airways.

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PALAVRAS-CHAVE

Intubação intratraqueal;
Manuseio das vias aéreas;
Emergências

Emprego de guia introdutor (bougie) artesanal para intubação em situação de emergência em pacientes que se apresentam com via aérea de difícil intubação: série de casos

Resumo

Justificativa e objetivos: A incidência de via aérea difícil chega a 10% das intubações de emergência. Ainda que poucos estudos abordem o emprego de guia introdutor artesanal no ambiente de emergência e terapia intensiva, há descrições de guias produzidas de forma artesanal disponíveis na internet. Nosso objetivo é descrever uma série de casos sobre o uso de um

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guia introdutor (Bougie) artesanal para intubação de emergência em pacientes com Via Aérea Difícil.

Relato de caso: O guia introdutor artesanal foi utilizado em cinco pacientes consecutivos com via aérea difícil, instabilidade clínica e falta de outro método imediato para a obtenção de uma via aérea. Essa técnica proporcionou sucesso na intubação e não houve complicações.

Conclusões: A utilização do guia introdutor artesanal pode ser uma opção útil para o manejo de via aérea difícil.

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Introduction

The inability to proceed with endotracheal intubation under direct visualization occurs in approximately 10% of emergency intubations. Besides being highly frustrating for the physician, this complication increases the risk to a patient who is already unstable.¹

For the American Society of Anaesthesiologists, difficult airway is defined as the clinical situation in which an experienced physician has difficulty with face mask ventilation, tracheal intubation, or both.² This difficulty is usually related to poor glottic visualization during laryngoscopy, classified by Cormack and Lehane into class III or IV (when the direct laryngoscopy allows only the epiglottis vision, or no vision of the epiglottis, respectively).^{1,3,4}

In this context, the use of an introducer guide is well documented for adult patients. It is an experience that comes mainly from the field of anaesthesiology and there are reports of its use in emergency and intensive care unit (ICU) environments.^{1,4,5} In addition, there are recent descriptions of handmade production techniques of this instrument – which can be of great value to professionals working in services with limited resources, unfortunately a frequent reality in our country.⁶

Case series

Case 1

A male patient, 14 years old, in immediate postoperative of thoracic spine arthrodesis for severe scoliosis and history of asthma developed severe bronchospasm and respiratory failure. After repeated attempts at intubation by different physicians (experienced in airway management), and in face of an inability to visualize beyond the epiglottis, a handmade introducer guide was used at the suggestion of the anaesthetist, allowing the intubation.

Case 2

A male patient, 73 years old, in postoperative of cholecystectomy for acute cholecystitis, was diagnosed with – diagnosis of difficult airway by the anaesthesia team. He progressed to septic shock and acute respiratory distress syndrome. After 18h of the procedure, there was an accidental extubation. In an attempt to reintubate, only the epiglottis was visualized – indeed, limited by abundant

secretion. In face of a progressive worsening of hypoxaemia, we chose to use the handmade introducer guide, which again resulted in a definitive airway.

Case 3

A female patient, 90 years old, with morbid obesity (body mass index=42), was transferred to the ICU for acute respiratory failure and decompensated heart failure. Laryngoscopy revealed Cormack III and ineffectiveness in ventilation with bag and mask. Again a bougie was successfully used.

Case 4

A male patient, 78 years old, with acute renal failure and nosocomial pneumonia developed acute respiratory failure. Laryngoscopy revealed Cormack III. The introducer guide was used to guide the intubation, which allowed obtaining an uneventful definitive airway.

Case 5

A female patient, 75 years old, was admitted to the ICU for acute ischaemic stroke with sudden sensorial loss by haemorrhagic transformation of stroke. The following presented as predictors of difficult airway: micrognathism and mouth opening of only 2 cm. Laryngoscopy revealed Cormack III and then the bougie was successfully used.

In these cases there was no clinical or radiological evidence of complications related to the use of the introducer guide. The patients had good outcomes, being subsequently discharged from ICU.

Discussion and conclusion

The introducer guide (described in the literature and in the market with various nomenclatures, such as Bougie, Gum Elastic Bougie, Eschmann Tracheal Tube Introducer®, Macintosh-Venn-Eschmann guide, or Frova®) is an ancillary device, consisting of semi-rigid materials which can be inserted with blind technique into the airway of patients with poor glottic visualization (Cormack-Lehane III or IV) (Fig. 1).

The use of an introducer guide, considered a cheap and easy to use method, is widespread in Europe and North America.^{1,4,7,8} Originally described by Macintosh in 1949,⁹



Figure 1 Introducer guide manufactured from thread guide (*passa-fio*).

currently its use is recommended by British anaesthetists as the first option in the management of difficult airways.¹⁰

In a prospective study evaluating the use of the introducer guide in the UK, its insertion rate at first attempt was 89% and the success in passing the endotracheal tube was 92.5%. More recently,⁷ Shah et al. evaluated its use in two emergency physicians training centres and the success rate was 79.6% (95% confidence interval: 71.1–88%).⁵ Another clinical study compared the use of the introducer guide in patients with Cormack–Lehane III and IV, with a success rate of 73%, which can be increased with the use of an auxiliary mirror in the hypopharynx, enabling indirect visualization of the trachea, with a success rate of 97%.¹¹

It is noteworthy that in patients with severe airway distortion and inability to recognize anatomical structures, with limited neck mobility or during brain-cardiopulmonary resuscitation manoeuvres, the introducer guide can allow a proper establishment of a definitive airway.^{12,13}

Although the time needed for intubation by the guide is greater than that requiring by direct laryngoscopy, the difference is considered clinically irrelevant. Moreover, the introducer guide can assist in various methods of approaching airways, such as: exchange of endotracheal tubes, obtaining a definitive airway from laryngeal mask, and insertion of two-lumen tubes, among others.^{8,14}

This technique is considered safe, but the incidence of iatrogenic airway injury and its severity are unknown. Conditions such as multiple intubation attempts in an emergency environment and an inappropriate positioning of the guide or

tube are acknowledged mechanisms of iatrogenic tracheal injury.¹⁵

Trauma secondary to its use may occur even if there is no difficulty in intubation or in mildly symptomatic patients.¹⁶ Generally, complications result from perforations by the guide or even during the passage of the endotracheal tube, mainly with description of lower airway injury, such as tracheal laceration, mainstem bronchi injury, haemoptysis, pneumothorax and/or haemothorax.

On the other hand, the bougie has the potential to introduce respiratory tract pathogens. In a study of contamination, cultures were positive in 55% of introducer guides and in 25% of their storage places.¹⁷ Therefore, it is emphatically recommended the sterilization of these tools between each use, preferably by immersion in a disinfectant solution or by formal sterilization. Each manufacturer specifies a maximum number of re-uses, but this recommendation is controversial.¹⁸

For its intended use, the bougie must be introduced directly into the trachea with the aid of the laryngoscope. If the vocal cords are not visible, the introducer guide should surpass the epiglottis in an anterior direction, maintaining the laryngoscopy. Upon entering the trachea, the operator should feel characteristic palpable vibrations (clicks), caused by slippage of the introducer guide tip in contact with the tracheal rings. This effect occurs when the introducer guide tip collides with a mainstem bronchus.^{11,19}

Once into the trachea, the laryngoscopy must be maintained and the bougie moved backwards by a few centimetres. Then, an assistant must slide the endotracheal tube over the guide, similarly to the Seldinger technique.^{5,19} In advancing the endotracheal tube, its bevel should be posteriorly oriented – which facilitates its insertion and avoids damage to the arytenoid cartilages. A summary of the technique for use of the introducer guide is available in Table 1.

The bougie can be handmade. To do so, a roll of plastic material used in construction for introducing electricity wires in conduits should be purchased. This material can be found in electrical equipment or construction shops, under the name of thread-guide (*passa-fio*) (a description of its making is available in <http://xa.yimg.com/kq/groups/1099152/952262112/name/2003+7-Guias+para+intubacao+traqueal.pdf>).

Of this material, 60–70 cm, preferably with 4–5 mm diameter, should be cut, and its ends should be sanded with a common sandpaper (to reduce the risk of injury). Subsequently, one of its ends (2.5–3 cm) should be folded at an angle of 40°, in the format of a hockey stick. This angle allows the tip of the introducer guide to be maintained in the midline, while the operator's hand that moves the introducer guide is kept out of the field of vision. After its manufacture, graduations must be produced at every 10 cm to facilitate its handling and correct introduction. It is worth mentioning that this choice of an artisan product has not been validated in any study or compared with introducer guides considered as the gold standard. The success and complication rates with the use of the bougie made with this material are unknown, but this device remains as an option to be validated. After the experience of this series of cases in our ICU, we chose to add a commercial introducer guide to our airway management arsenal.

Table 1 Protocol for intubation with introducer guide.*If the vocal cords are visible:*

Insert the introducer guide;
 Feel palpable vibrations (or clicks);
 Insert the endotracheal tube over the guide (without removing the laryngoscope);
 Rotate the endotracheal tube 90° clockwise before passing by vocal cords (keeping the bevel of the tube posteriorly directed eases its positioning and prevents arytenoid injury);
 Remove the guide, while maintaining the endotracheal tube positioned;
 Confirm proper endotracheal tube position.

If the vocal cords are NOT visible:

Insert the introducer guide in a most anterior position possible, until palpable clicks are felt;
 Advance the endotracheal tube by the guide, till it "locks" or with a maximum distance of 45 cm;
 If no vibrations (or clicks) are perceived or any feeling of resistance after 20–40 cm (the "lock"), probably the introducer guide will be in the oesophagus;
 Move the guide a few centimetres backwards before inserting the endotracheal tube;
 Rotate the endotracheal tube 90° clockwise before passing by vocal cords (keeping the bevel of the tube posteriorly directed eases its positioning and prevents arytenoid injury);
 Remove the guide, while maintaining the endotracheal tube positioned;

Confirm proper endotracheal tube position.

Remember that while the laryngoscopy and insertion of the guide are performed, an assistant must be prepared to advance the endotracheal tube over the guide (keeping its position).

Adapted from Ref. 4,11, and Kaushal (2011).

Finally, the use of the introducer guide is a simple and cheap technique with the potential to address serious problems. Furthermore, it requires little training for professionals already used to intubation of trachea under direct visualization. Although the use of a bougie does not exclude other adjunct methods for airway management, its availability should be considered in all hospital environments.

Conflicts of interest

The authors declare no conflicts of interest.

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