Rev Esp Anestesiol Reanim. 2018;65(7):385–393

Revista Española de Anestesiología y Reanimación

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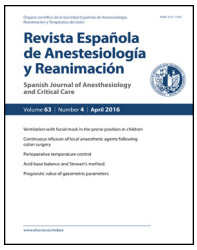

REVIEW

The Vortex model: A different approach to the difficult airway☆

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Received 23 March 2018; accepted 28 May 2018

KEYWORDS
Difficult airway;
Airway management;
Algorithm;
Vortex approach

Abstract Airway management is an essential area in anaesthesia, and anaesthesiologists are considered the most expert professionals to manage airway tasks. However, complications related to inadequate airway management remain the most frequent cause of morbidity and mortality.

Algorithmic strategy to solve difficulties fails, due to several factors related to its structure and clinical application.

The Vortex Approach has emerged as a response to the limitations found in the algorithmic strategy of managing the difficult airway, by using a cognitive aid strategy to reduce cognitive load and fixation error. This new strategy may represent a solution to the elusive problem of the challenging airway and reduce the complications rate.

PALABRAS CLAVE
Vía aérea difícil;
Intubación difícil;
Algoritmos;
Vortex

El modelo del Vórtex: una aproximación diferente a una vía aérea difícil

Resumen El aislamiento de la vía aérea es un área esencial en la anestesia. Los anestesiólogos se consideran los profesionales más expertos para resolver cualquier problema relacionado con una vía aérea difícil. Sin embargo, las complicaciones derivadas del manejo incorrecto de la vía aérea siguen siendo una de las causas más frecuentes de morbimortalidad asociada a la anestesia.

☆ Please cite this article as: Charco-Mora P, Urtubia R, Reviriego-Agudo L. El modelo del Vórtex: una aproximación diferente a una vía aérea difícil. Rev Esp Anestesiol Reanim. 2018;65:385–393.

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La estrategia mediante algoritmos de tratamiento para resolver estas dificultades ha demostrado su fracaso debido a varios factores relacionados con su estructura y su aplicación clínica.

El enfoque Vortex surge como una respuesta a las limitaciones encontradas en los algoritmos de manejo de una vía aérea difícil, utilizando una estrategia de ayudas para reducir la carga cognitiva y el error de fijación. Esta nueva estrategia puede representar una solución al problema de la dificultad de la vía aérea y, poder así, reducir la incidencia de complicaciones.

Introduction

Successful airway management continues to be a fundamental skill for anaesthesiologists, and these specialists are considered the best qualified to deal with difficult airway situations. However, problems stemming from poor airway management are still the most common cause of anaesthesia-related morbidity and mortality.[1]

Management of a difficult airway is an example of a typical predictable clinical situation, even though a difficult airway in a specific patient might not be foreseen. All specialists involved in airway management know that an unanticipated difficult airway can be encountered at any time. From the perspective of the patient (and legal regulations), a difficult airway can be considered a typical, quantifiable and predictable complication.[2] Similarly, although infrequent in routine clinical practice, surgical teams must be prepared to deal with and successfully resolve an airway crisis. Inappropriate clinical management can worsen the situation and further restrict airway access,[3] and ignorance and inadequate training contribute to the appearance of complications in up to 50% of cases.[4]

Generally speaking, there are 4 airway management approaches or strategies:

- ***Facial approach***: including the different oxygen therapy techniques (ranging from common nasal cannula to high-flow systems), manual ventilation with a face mask (with adjuvants), and different forms of ventilatory support using a facemask (such as non-invasive mechanical ventilation, Oxylator, etc.).
- ***Transglottic approach***: involves introducing a device into the trachea through the glottic opening. Tracheal intubation is the gold standard for airway management.
- ***Supraglottic*** (or extraglottic) ***approach:*** involves the use of devices that seal the hypopharynx to deliver positive ventilation. Some of these supraglottic devices include adjuvants to prevent gastric aspiration (such as a gastric suction channel or drainage tube).
- ***Infraglottic approach*** (front of neck access, or FONA): involves accessing the airway by means of an incision that, due to the anatomy of the neck, is usually made through the cricothyroid membrane (cricothyroidotomy).

Table 1 Failure rates of the four airway management approaches.[1]

Facemask ventilation	<1 in 700
SAD ventilation	<1 in 50
Tracheal intubation	<1 in 1500
CICO status	<1 in 5000
Front of neck access	~1 in 50,000

Table 1 lists the failure rates of the different airway approaches. It is important to note that the failure of 1 approach increases the possibility of failure of the next. For example, in an obese patient with positive predictors of difficult intubation, the likelihood of ventilation difficulty is greater (including ventilation through a supraglottic airway); likewise, percutaneous access to the airway can also be complicated.

Fortunately, when 1 approach fails, another can be tried, and all can be used indistinctly to secure the airway and oxygenate the patient.

The number of anaesthesia-related complications has declined in recent decades. Serious complications caused by hypoxaemia after intubation failure, such as permanent neurological damage or death,[5,6] have spurred researchers to develop new strategies and technologies to improve the standard of care and improve patient safety.

Efforts to improve airway management have led to the development of new technologies. These include videolaryngoscopes (with standard or difficult intubation blades), various optical devices that incorporate the latest CMOS technology (such as video stylets and video endoscopes), as well as sophisticated, state-of-the-art supraglottic devices, even with passive oxygen insufflation. To these can be added the latest techniques for denitrogenation or oxygenation through high flow nasal cannula (THRIVE), together with advanced systems for monitoring tissue oxygenation and different ventilatory methods (neural control of ventilation). Scientific societies, for their part, have developed their own treatment algorithms to implement all these new technologies in a structured manner, based on expert consensus and the best available evidence.