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Videolaryngoscopy

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SUMMARY

The adaptation of videotechnology for laryngoscopy appears to be an interesting and promising option in the field of airway management. The place of videolaryngoscope-assisted intubation in airway management has yet to be determined. This article will aim to describe the technique of videolaryngoscopy, discuss the videolaryngoscopes that are currently available and give a summary of the available evidence for their use.

1. Introduction

Fibreoptic intubation is the gold standard in the management of an anticipated difficult airway. However, considerable training and practice is required for developing the skills needed to achieve proficiency in endoscopy. The learning curve for accurate sequential identification of airway anatomy required for the management of a difficult or pathological airway is steep. Also, fibreoptic bronchoscopes are expensive, fragile and have significant maintenance costs. Fibreoptic bronchoscopes (FB) may not always be appropriate in airway trauma or significant in upper airway obstruction.

The recent American Society of Anaesthesiologists (ASA) closed claim analysis revealed uniformly adverse outcome and airway trauma following repeated attempts at intubation with conventional methods. It recommended that conventional intubation attempts should be limited to three attempts, before using other strategies.[1] In the event of unexpected problems in intubation, fibreoptic intubation takes time to setup and may not be possible, if either the equipment or the skilled assistance is not immediately available.

Several devices have been introduced in the last decade to bridge the gap between direct laryngoscopy and FB. However, the quest for an ideal device that performs consistently and reliably in a difficult airway scenario, especially in an unanticipated difficult airway and functions as a standard laryngoscope has not been successful so far.

The adaptation of videotechnology for laryngoscopy appears to be an interesting and promising option in the field of airway management. The place of videolaryngoscope-assisted intubation in airway management, if any, has yet to be determined. This article will aim to describe the technique of videolaryngoscopy, discuss the videolaryngoscopes that are currently available and give a summary of the available evidence for their use.

2. Technique of videolaryngoscopy

Conventional laryngoscopy depends upon achieving a line-of-sight from the operator to the glottic inlet. Traditionally “sniffing the morning air position” with flexion at lower cervical spine and extension at atlanto-occipital joint is recommended for direct laryngoscopy. This results in optimum alignment of the three axes: oral, pharyngeal and laryngeal to achieve a “line-of-sight” for adequate exposure of the vocal cords. Although this position is successful for intubation in a large number of cases, in approximately 1–4% of patient’s laryngoscopy may still prove difficult.[2] Most anaesthetists are well-versed in using the classic Macintosh type laryngoscopes for routine intubation. In contrast, most intubations with poor Cormack and Lehane grades are often effectively blind and require additional manoeuvres such as increased neck flexion, external laryngeal manipulation or the use of gum elastic bougie or stylet.

Videolaryngoscopes resemble traditional laryngoscopes and have a videochip embedded in the tip of laryngoscope blade. This transmits magnified images to a display screen where they can then be viewed or recorded. Since the camera is positioned a few millimetres from the vocal cords alignment of the oral, pharyngeal and laryngeal axes for a line-of-sight is not essential.[3] This enables the operator to “look around the corners” which previously was not possible with conventional direct laryngoscopy. This method of laryngoscopy is the “indirect method” as apposed to direct laryngoscopy with conventional laryngoscopes such as Miller, Macintosh or McCoy.

Videolaryngoscopy consistently improves the view of the larynx even in conditions where direct laryngoscopy may lead to poor view e.g., with immobilised cervical spine. The images obtained can

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be recorded, replayed and viewed by a wide audience. This facilitates teaching, research and accurate documentation. For anaesthetists accustomed to conventional laryngoscopy, hand–eye coordination and additional training is needed to develop the dexterity needed to thread the endotracheal tube while viewing the display screen of the videolaryngoscope.

3. Classification of videolaryngoscopes

Broadly speaking, videolaryngoscopes can be classified in two categories depending on the method of tube advancement:

1. Videolaryngoscopes with integrated tube channel.
   Airtraq, Pentax airwayscope
2. Videolaryngoscopes without integrated tube channel
   Glidescope, McGrath, C-Mac

3.1. Glidescope

The Glidescope videolaryngoscope has been commercially available since 2001. The device consists of a handle and a non-detachable blade (Fig. 1). The laryngoscope blade is made of high resistance medical grade plastic and the distal third of the blade anglulates upwards, at approximately 60 degrees. It has a maximum width of 18 mm at any point. The videocamera is incorporated on the under surface of the blade at the inflection point with the view oriented anteriorly. Two light-emitting diodes adjacent to the videochip provide adjustable illumination. To use the Glidescope, the manufacturer's recommendation is to advance the laryngoscope in the midline, identify the uvula; the blade should then be inserted anterior to the epiglottis until the vocal cords are identified. Any resistance to advancement of the tube is managed by withdrawing the Glidescope by 1–2 cm. This allows the glottis to drop down, making the angle of approach of the tracheal tube more favourable. The use of a pre-shaped stylet with curvature matching the shape of the blade is recommended to facilitate intubation.

The Glidescope is available in four sizes covering a range from neonates to large adults. Two additional versions in addition are also available. The Glidescope cobalt is a single-use laryngoscope with disposable plastic blade which slides over the flexible video baton. The Ranger model has smaller portable screen intended primarily for pre-hospital use.

The Glidescope has a short learning curve and consistently gives improved laryngoscopic view as compared with direct laryngoscopy with Macintosh laryngoscope in patients with a Cormack and Lehane grade greater than one. It has been used successfully in patients with immobilised cervical spine, ankylosing spondylitis (AS) and in the morbidly obese. The main limitation of the GS as compared with standard laryngoscopes is the difficulty in advancement of the tracheal tube. In the initial clinical evaluation, a failure rate of 3.7% (26 of 722 patients) was reported. Fourteen of these 26 patients were subsequently found to have grade 1 view on direct laryngoscopy. In patients with normal airway anatomy, Teoh and colleagues encountered difficulty in aligning the endotracheal tube with the laryngeal inlet in 13% of patients.[5] They also reported a higher incidence of mucosal trauma, bleeding and sore throat with Glidescope use.

Recently, there have been reports of palatopharyngeal injury with Glidescope.[6] This has been attributed to the blind advancement of the endotracheal tube before it is visible on the monitor.

With a separate display screen, the Glidescope is probably more useful in the hospital setting in difficult laryngoscopy, fixed cervical spine and in teaching laryngoscopy skills to novice trainees. The available evidence also supports its use in paediatric patients.

3.2. Airtraq laryngoscope

The Airtraq is a disposable videolaryngoscope with an anatomically shaped blade that has two parallel conduits: the optical and guiding channels (Fig. 2). A low temperature battery operated light is present at the tip of the blade. The optical channel contains a high definition optics system, which transmits the image to the proximal viewfinder using a combination of lenses and prisms. An anti-fog system is built into the optical channel which requires 30–45 s warm-up time. Special blades for paediatric intubation and placement of double lumen and nasal tubes are available.

To use the Airtraq, the endotracheal tube is preloaded in a track next to the optical pathway, and the device is inserted in the oropharynx. When the glottis is visualised, the ETT is advanced down the track into the trachea. The Airtraq is then removed, disengaging the ETT with a lateral movement. If the vocal cords are not visible, it usually means that either the laryngoscope is not in the midline or placed too posteriorly in the vallecula. The endotracheal tube emerges from the right and slightly posterior to the optical channel. If difficulty is encountered in advancing tube despite good view, withdrawing the laryngoscope helps in alignment of the tube. In morbidly obese patients, it may be difficult to insert Airtraq and

Fig. 1. Glidescope.

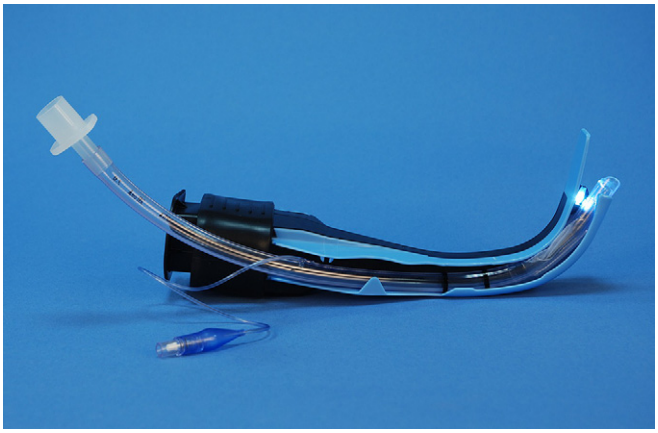

Fig. 2. Airtraq laryngoscope.