

AIRWAY EQUIPMENT UPDATE

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A plethora of new airway equipment has become available over the past few years. It has become increasingly difficult to know what is useful and therefore what one should have in one's armamentarium for routine and for difficult airway management.

One should compare the new equipment with the tried and tested gold standards, and ask whether in fact the new items add any value to patient management and safety. New items should have a specific purpose, as duplication in a difficult intubation trolley may in fact dilute resources and skills rather than improve safety. One should make one's acquisition of new equipment evidence based. This is a relatively objective area of practice and we should look at what works best in trials rather than being seduced by what seems appealing at a trade show.

Our College has recently recognized the importance of having appropriate equipment for difficult airway management and a College Guideline will be published in the next few months. This will recommend minimum equipment that should be available for Airway management, at all locations that provide Anaesthesia. Standardisation and familiarity is vital. The equipment is only as good as the skills of those that are to use it.

Classification of New Airway Equipment

1. Rigid video laryngoscopes
 - With guiding channel, eg Pentax Airway Scope, Airtraq
 - Without guiding channel, eg Glidescope, McGrath videolaryngoscopes
2. Intubating stylets, eg Shikani, Levitan, Bonfils Intubating Stylets
3. Supraglottic devices
 - LMA modifications, eg Supreme LMA, C Trach LMA
 - Others, eg Cobra, SLIPA, Laryngeal tube, iGel

The Equipment

1. Videolaryngoscopes

The videolaryngoscope (VDL) is an indirect laryngoscope that allows the user a non-line-of-sight view of the larynx. A good light source and a camera built into the laryngoscope blade are attached to a monitor via a fiberoptic system. Clear images of the larynx are thereby relayed onto the monitor.

The blade can be used to lift the whole epiglottis or the tip can be placed in the vallecula like a conventional Macintosh laryngoscope. Studies show that the Cormack and Lehane (C/L) score is usually improved by a factor of 1 when compared with conventional laryngoscopy. (1) The VDL is an excellent tool for teaching laryngoscopy as it allows the teacher to see what the student is looking at when the laryngoscope is in the patient's mouth.

VDL's in practice are useful in obese patients, as the blade will retract tissue well, in contrast to the flexible fiberoptic scope. They have been effective in emergencies when secretions and blood soil the airway. They are relatively robust. There are a few studies that show decreased C spine movement, though one does not totally



eliminate this movement. (2) Minimal force can be exercised when using a VDL and so it is being used increasingly for awake intubations.

While one gets a good view with the VDL there is sometimes a problem manipulating the endotracheal tube (ETT) into the larynx (all VDL's). This occurs because there is no line of sight and therefore no space through which to pass the ETT. The angle that the ETT has to turn to enter the larynx is more acute than with conventional laryngoscopy, hence the need for a hockey stick shaped stylet.

There are a couple of case reports of damaged pharyngeal or soft palate tissue with the Glidescope. (3) The problem is that one does not necessarily see the tip of the ETT as it enters the oropharynx and so care needs to be taken before entering the field of vision of the VDL.

A Meta-analysis looking at new airway devices published in *Anaesthesia* in 2008 (finished in 2006) (4) suggested little advantage of the new equipment over direct laryngoscopy. The situation has changed now, however, as there are a number of studies involving VDL's that show superior views and increased success with intubations. This has been shown in different patient groups: normal, obese, difficult airways, and decreased neck movement. (3)

There are a few studies now comparing the different VDL's, most of these on manikins: One manikin study (5) shows the Pentax AWS has a slight edge over the Glidescope with regard to ease of intubation. The Airtraq revealed slightly more trauma than the Glidescope in a group of known difficult intubation patients with oropharyngeal tumours. The 2 VDL's achieved similar success rates and views. (6)

Glidescope VDL

This VDL projects the image of the larynx onto an external screen via a cable. It has a good wide visual field. The image is displayed on a large Colour LCD screen which is mounted on a separate stand. There are 4 disposable blades which cater for neonates, paediatrics, and adults. The Glidescope is sold with a Malleable stylet with an angle tip of 60°, enabling the user to get the endotracheal tube (ETT) anterior enough to insert into the trachea. Studies have shown equal or better views of the larynx when compared with direct laryngoscopy. Studies include experienced and novice users, and patients with normal and difficult airways. (7, 8)

McGrath VDL

This is a fully portable VDL. It has a disposable blade which has an adjustable length. The small LCD screen sits on top of the laryngoscope handle. Manufacturers suggest a hockey stick shaped stylet as with the Glidescope. An impressive case series shows how this VDL improved the C/L grade 3 or 4 views obtained with a Macintosh laryngoscope to a grade 1 view. (9)

Pentax Airway Scope AWS-S100

This is another portable battery operated VDL which combines a camera stick with a disposable rigid curved blade. The LCD screen is tiltable and is mounted on the handle. The blade is called the rigid P blade, it also has a suction channel and a separate groove that holds and guides the ETT.

The blade is designed to lift the epiglottis. A target mark on the monitor indicates the direction of the ETT as it advances. One aligns the target mark with the laryngeal opening to ensure that the ETT enters the larynx.

The view obtained is not affected by the patients C/L score as the blade lifts the epiglottis. In a cross over study of 203 patients with decreased neck movement the AWS achieved 100% visualisation and intubation vs 89% with MAC and bougie. (10) An impressive study reported easy intubations even in patients with C/L grade 3 and 4 views with a Macintosh laryngoscope. (11)



Airtraq Laryngoscope

This is a disposable, portable, battery operated VDL. It has a screen above the curved laryngoscope handle and also has a guiding channel. It comes in a range of sizes. The image is transmitted by a combination of prisms and lenses.

Studies have again shown better or equivalent views as compared to Macintosh laryngoscopy, (12) with less CVS response. The quality of the image is not equivalent to other VDL's, though this has not been shown to decrease success in studies.

2. Intubating Stylets

Intubating stylets can be thought of as stylets or bougies that one can see through. Fiberoptics are incorporated into their tip so that one can visualize what lies ahead of the stylet, either through the eyepiece or on a monitor. Not surprisingly, studies have shown optical stylets to be superior to conventional metal stylets. (13)

There are a number of optical stylets on the market including the Levitan, Shikani, Bonfils and Styletscope. They differ in length and in the quality of their fiberoptics; however they are all similar in that they are long narrow rigid scopes with distal curves. They can be inserted into the middle of the mouth by retracting the tongue and jaw manually. The other described technique is a retro-molar approach, similar to straight blade laryngoscopy. They are also used in combination with the Macintosh laryngoscope, like a conventional bougie that one can look through when one is unable to see the larynx.

An optical stylet (the StyletScope) was compared to the Pentax Airway Scope VDL for simulated difficult airways and both scopes had high success rates, however the Airway Scope was faster and had a higher successful intubation rate. (13) The Bonfils retromolar fibroscope was found to be more successful than the Macintosh laryngoscope in patients with immobilized C spines and decreased interincisor distance. It was also associated with less C spine movement than the Macintosh laryngoscope. (14)

Proponents of their use consider the intubating stylet to be quicker, easier, and more robust than flexible fiberoptic bronchoscopes.

3. Supraglottic Devices

Some very effective laryngeal mask airway (LMA) modifications have been developed in the past 10 years. Most anaesthetists are familiar with the Intubating LMA and the ProSeal LMA. Both are widely used and valuable assets in airway management. More recently, the Supreme LMA was introduced as a disposable LMA and studies have shown it to be as effective as the original ProSeal for insertion success, glottic seal pressure and gastric access. There have been many disposable imitations of the original LMA classic, though none have been shown to be superior to the original.

New designs include the iGel that is a preformed solid LMA that does not require any air. An advantage is that the cuff will not change shape or increase in volume when air is inserted or when nitrous oxide is administered. This should decrease the risk of pressure effects of the LMA, including nerve damage. The Cobra Perilaryngeal airway has a large circumferential sealer cuff, which provides higher sealing pressures than the LMA; however there is a concern that there is an increased risk of aspiration with this device.

The C Trach LMA

This is an intubating LMA with a fiberoptic camera lens at the base of the laryngeal mask enabling visualisation of the larynx when the LMA is in place. One can then watch the ETT as it passes into the larynx. Aligning the LMA with the laryngeal inlet enables easy passage of the ETT into the trachea. A major advantage of this technique in the difficult airway is that one can ventilate and oxygenate while intubating the patient. There is a higher first pass success than with regular Intubating LMA's. (15) There are reports of poor initial views that need to be overcome by manipulating the LMA.



Conclusion

This presentation outlines some of the new airway equipment available, much of which is making airway management easier and safer. Before we blow the hospital budget on these exciting new items, however, we should consider the audit published last year by Baker *et al* (16). This showed us that there are deficiencies in most New Zealand anaesthetic departments' airway equipment. Equipment for an unexpected difficult intubation, as recommended in the Difficult Airway Society (DAS) guidelines, was deficient at all sites. Equipment to detect oesophageal intubation was inadequate. Locations remote from the operating suite lacked emergency invasive airway equipment, and were too far from the nearest appropriate equipment. Quality control was poor in most instances.

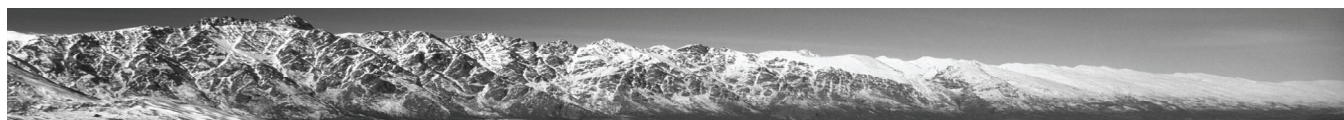
It is imperative that the emergency airway equipment is adequate, where anaesthesia is performed. Anaesthetists must be familiar with the equipment before it is needed in an emergency. The ANZCA guideline for airway equipment is imminent and will hopefully make a difference for those departments or hospitals acquiring the necessary equipment.

It is useful to consider when you would use the new equipment when managing a difficult airway. The VDL's and intubating stylets fit into plan A (the initial attempt at intubation) of the DAS guidelines very well, (17) either as the primary laryngoscope, or as the alternative laryngoscope, or the bougie. In plan B one needs to remember to continue with oxygenation and ventilation, this eliminates the new equipment, apart from the LMA C Trach.

A number of new pieces of airway equipment have been discussed. Most of these items are still very new, however early evidence indicates that some of them, most likely the VDL's, are going to be with us for some time. They are easier for novices to use and are therefore likely to improve safety of airway management for non-experts. They allow the anaesthetist to manage the difficult airway more easily and effectively, and they may, in fact, reduce the incidence of the "difficult airway."

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