The "5 in 1" Technique — Fusing the Elements of Airway Management

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Introduction

In this essay, we describe our airway management technique. This is designed primarily for dealing with the difficult airway, but may also be useful in a variety of other roles, e.g. teaching airway skills, assessing the difficult airway and minimising the risk of dental trauma. We explain the philosophy of the technique and present some of our experiences.

Background

The fact that the glottis can frequently be seen using a fibreoptic endoscope introduced through a laryngeal mask airway is well recognised.[1] To convert this view into a secured airway of one's choice may be a challenge. There have been many ways suggested,[2-11] but they mostly require either significant modification of equipment, somewhat impractical setups, or purchase of expensive additional items. They often result in a less than satisfactory final airway. We believe that our technique has an advantage over previously suggested methods, in that it uses familiar, readily available equipment and finishes by securing the airway with a cuffed endotracheal tube of the desired size.

The 5 in 1 Technique

The steps outlined in Tables 1-3 provide the essentials of our "5 in 1" technique. As will be noted, there are five items of equipment, and five steps in the sequence.

Table 1
5 in 1 technique — Equipment

1. #3/#4 LMA, modified by removal of the grilles (mLMA)
2. fibreoptic endoscope [FES]
3. noncuffed 6.5 mm I.D. endotracheal tube [6.5 ETT]
4. gum elastic bougie, in reverse orientation [GEB]
5. cuffed endotracheal tube of the desired size [cETT]

Table 2
5 in 1 technique — Sequence

1. placement of mLMA
2. FES (preloaded with 6.5 ETT) guided through LMA into the trachea
3. 6.5 ETT advanced over FES into the trachea, FES then removed
4. GEB replaces FES in 6.5 ETT; mLMA & 6.5 ETT then removed over GEB
5. GEB then used to guide placement of cETT in the trachea

Table 3
5 in 1 technique — Continuity of oxygenation & anaesthesia

1. at the beginning via mLMA
2. midsequence via 6.5 ETT

Explanatory notes

1. The 5 in 1 starts with the laryngeal mask airway (LMA) because it can usually be used to maintain ventilation in patients with difficult airways.
2. The LMA is both a conduit and a support for the fibreoptic scope (FES), "delivering" the latter to the glottis.
3. The grille is removed from the LMA both to improve the view downwards with the FES and facilitate its passage.
4. The noncuffed tube should be regarded as a conduit for subsequent tube exchange. The particular calibre is chosen because it is the largest which can fit down the lumen of the LMA, allowing easy removal of the FES and insertion of the GEB. It also allows the option of ventilation/oxygenation in the middle of the sequence.
5. The gum elastic bougie is reversed because the straight end runs more smoothly down the conduit tube.
6. When the endotracheal tubes are advanced through the glottis they require rotation in the same way as for a nasotracheal intubation

Our Experience

Between May 2001 and June 2002, we used this technique on 26 patients, aged from 18 years to 82. Fourteen were male and 12 female. Table 4 shows the "difficult airway status" of these patients.

The patients with "known difficulty, requiring intubation" were known to have been easy to ventilate on previous occasions. Of the patients classified as "difficulty suspected, requiring intubation", 10/12 had Cormack and Lehane gradings of greater than 2.

The patients "not requiring intubation" were assessed after introduction of the LMA. Those with "known difficulty, not requiring intubation" all had the glottis visible

Table 4
Airway difficulty in 26 patients

	Known Difficulty	Difficulty Suspected	Unanticipated Difficulty
Surgery Requiring Intubation	4	12	5
Surgery Not Requiring Intubation	3	2	N/A

Known difficulty=Cormack & Lehane[14] grade >2. Suspected difficulty=abnormal airway examination. Unexpected difficulty="normal" airway examination. N/A=not applicable.

through the LMA, but were subsequently not intubated. The patients with "difficulty suspected, not requiring intubation" were confirmed under anaesthesia as C&L >2. Both had the glottis visible through the LMA and were not intubated.

The epiglottis obscured the immediate view of the glottis in 3/26 cases (consistent with literature). Minor manoeuvring of the tip of the FES overcame this problem in all instances. The tube exchange was straightforward in 20/21 cases who were intubated, and was achieved without injury to the patient in all.

All patients had their own teeth. No difficult airways were encountered in edentulous patients.

From this experience, we suggest that the "5 in 1" technique offers advantages in several practical areas, discussed below.

Assessing is One Thing, Managing Another: The Assessment-Management Dichotomy

In our specialty, prediction of the difficult airway remains problematic. It is ironic that the first scientific analysis of endotracheal intubation, the 1944 "alignment of the axes" theorem of Bannister and McBeth,[12] was in fact a scientific fraud.[13] There is as yet no fail-safe method of predicting airway difficulty, despite numerous published techniques.[14-24] Unanticipated difficulty and crisis remain realistic threats.

There has been rapid growth in the number of airway management devices — LMA, FES, GEB, endotracheal tube exchangers, the Ovassapian airway, cricothyroidotomy and percutaneous tracheostomy kits — to name a few. Some of these (e.g. the LMA), have been incorporated into daily practice, but most are rare-use items, brought out only when difficulties are encountered. Equipment for the difficult airway may therefore be unfamiliar, poorly used or may not be well selected for the situation at hand.

In vitro models (e.g. BronchoBoy™, Dexter™, AirMan™) have been introduced to at least provide some opportunity for practice outside the clinical environment. They are mostly designed for improving skills in fibreoptic endoscopy. The Human Patient Simulators are useful for practising decision making, but are not yet accurate in terms of the manual dexterity experience.

The central paradox of difficult airway management is that, despite assessment and prediction techniques, and the availability of special equipment and devices, there is no logical pathway leading from assessment to actual choice of management strategy and technique. As there is no such path, an inherent risk of over~ or underreaction is established. The cautious will subject their patients to awake intubation at a mere hint of a problem, whereas optimists believe that all they need is a GEB, a McCoy blade and a strong arm. As airway assessment/prediction is unlikely ever to be an exact science, the challenge is to improve the management side of the equation.

Practice Makes Perfect — The Teaching Conundrum

Trainees are aware that difficult airway scenarios are uncommon, not completely predictable, call on seldom practiced skills and equipment, and can possibly spiral into disaster. This prospect creates anxiety and fear of failure. Production pressure during surgical lists limits the opportunity for teaching and practice of such unfamiliar techniques. The development of the in vitro models, as mentioned above, is in an attempt to fill this gap.

We suggest that the "5 in 1" is a potential in vivo teaching model. It can be used[1] in staged fashion whenever a LMA is placed, to practice holding and manoeuvring a FES

down to a level just above the vocal cords. This provides practice not only with dexterity skills, but also with recognition of the anatomy.[2] As a whole technique, it can be used for any patient who requires endotracheal intubation as part of their anaesthetic. This does not significantly delay list progress, so it can be incorporated into the daily routine, and is a good opportunity to discuss issues around airway management. For trainees particularly, this may rectify some of the problems encountered when trying to gain experience with difficult airways. Experience in nonessential situations makes success in essential situations more likely.

Dental Trauma — A Tale of Two Teeth

Dental trauma has been identified as an issue in anaesthetic practice for years.[25-27] Indeed, it was one of the driving forces behind the introduction by Magill of the blind nasal technique of intubation.[25] Macintosh felt there was less risk to the upper teeth if a curved blade was used.[26] Whilst some would argue that dental trauma occurs infrequently and that, when it happens, there are bigger issues to consider (e.g. hypoxaemia), it remains the single biggest source of medicolegal complaints against anaesthetists across The United Kingdom, Europe, The United States and Australasia being the basis for 30% of all claims.[28-30] Of note, the pattern of injury has remained unchanged over 30 years and four continents.

The literature has been well reviewed by Owen et al.[27] The reported incidence of trauma is highly variable (0.02-0.7%), although this figure is for damage assessed by either patient or anaesthetist. When assessed by a dentist, the figure rises to an alarming 12.1%.[31] The upper central incisors are most at risk, with usually one tooth being damaged. The likelihood of damage increases if there is preexisting dental pathology, anterior crowding, isolated teeth or poor intubating technique. There are two detailed sets of New Zealand data, derived from Accident Compensation Corporation (ACC) claims information.[32,33] These span periods of 15 months (1983-85) and 100 months (1992-2000), with no real change in the rate of complaint over nearly two decades. Over 80% of damage was to upper incisors, usually one tooth, and mostly involved chipped or fractured teeth. Stringent ACC criteria for acceptance of claims led to most being denied between 1992-2000 (459/500). The 41 accepted claims averaged a $500.00 payment so, by extrapolation, the hidden cost over 500 submitted claims is of the order of $250,000. Overall, the evidence is "highly suggestive of laryngoscopy being a major factor"[27] in dental damage.

How does this link in with the "5 in 1"? A laryngoscope is not used in our technique, so the risk of dental trauma is reduced. Hence the "5 in 1" may have a useful role in the following circumstances:

1. known difficult intubation;
2. initial laryngoscopy reveals an awkward or difficult view, particularly in association with the known risk factors for dental injury; and,
3. there is prosthetic dental work in the front teeth which may be put at risk.

Some patients, worried about the risk to their teeth posed by their anaesthetic procedure, have been reassured to know that alternatives exist to the use of the laryngoscope.

Summary

In conclusion, the "5 in 1" technique uses readily available, familiar equipment, combining what we believe to be the best characteristics of each device. It is effective

for the difficult airway in a variety of ways, from assessment to management. It facilitates the regular use of fibreoptic endoscopy in the clinical environment, thus increasing the level of skill for when it is needed most. It may also be used to minimise the risk of dental trauma, by avoiding the use of a laryngoscope. It is a fusion of ideas and equipment to form an effective, multipurpose technique.

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