AIRWAY UPDATE

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This talk will discuss three topics that are proving to be influential in current airway management. Firstly, I will briefly mention one of the most important and prominent publications in recent years, the 4th National Audit of the Royal College of Anaesthetists on Major Complications of Airway Management (NAP4).[1] Secondly, I will discuss the difficulties of establishing the proper role of videolaryngoscopy (VL) in airway management and airway algorithms. And finally, I will discuss the now trendy use of nasal prongs to facilitate apnoeic oxygenation during intubation.

Lessons from NAP4

Given the size of NAP4 and its heavy presence in the literature, today I simply aim to either introduce or remind the audience of what this audit involved, and give three examples of how its findings influence current clinical practice and education.

During the year 2008-2009, the Royal College of Anaesthetists, in a joint project with the Difficult Airway Society (DAS), boldly attempted to capture every single major complication from airway management that occurred in the United Kingdom. By "major", we mean catastrophic – that is, death, brain damage, emergency surgical airway or intensive care unit (ICU) admission that resulted directly from airway management. All 309 NHS hospitals were involved, with appointed NAP4 representatives in 286 anaesthesia department to facilitate the capturing of cases. In addition to anaesthesia-related airway events, events that occurred in the emergency department (ED) or ICU were also included.

Once a case was identified, it was reported by means of an online questionnaire. The questionnaire had 164 questions; a mixture of multi-choice and free-text boxes. This arduous case-logging process is both the greatest strength and the greatest weakness of the NAP4 report – it provided an enormously detailed case series, however it is estimated that as many as 3 in 4 cases may have been missed.

Nevertheless, 286 cases were reported – 184 of which reached inclusion criteria. Each case was then reviewed twice by an expert committee, which included representatives from twelve relevant bodies of medical professionals, who looked for causes and themes.

To be able to calculate incidences current denominator data is required. To this end, in addition to the case series, a two-week UK-wide census was performed that aimed to record every single anaesthesia-led airway management event. The data was then extrapolated to estimate annual figures. No census was performed for ED or ICU environments.

In March 2011 the NAP4 committee published their findings in a 218 page report. The 184 cases of major airway complications led to 176 recommendations. One criticism frequently made is that in some situations the committee stepped beyond the evidence when making recommendations. However the committee makes no apologies for this, stating that the "authors and editors have taken as broad a view as possible in producing learning points in an attempt to maximise the value of the report" and as such "they represent a combination of literature interpretation, case review and expert opinion."

In my opinion, three important NAP4 findings include –

1) <u>The routine use of capnography in ICU and ED, and its ready availability in the recovery room, is the single change with the greatest potential to prevent disasters like those reported to NAP4</u>

In the ICU setting, failure to use capnography was implicated in 17 (82%) of events leading to death or brain damage. There were four cases in which an absence of capnography in the recovery room was said to be

contributory. Correct use and interpretation of capnography would have likely prevented half of the deaths in the ED (2 cases). There were seven deaths caused by unrecognised oesophageal intubation, two of which occurred in the operating room despite the presence of mandatory capnography. These two patients so rapidly deteriorated to cardiac arrest that the flat capnography trace was attributed to the absence of cardiac output. This serves as a reminder that when a patient is receiving CPR, the capnograph should be of low amplitude, not flat. A flat capnograph either means the ET is not in the oesophagus, or it is occluded (eg by a blood clot or mucus).

In the UK continuous capnography is now considered to be standard of care for every patient who is intubated, receiving moderate or deep sedation, or ACLS.[2,3] The European Board of Anaesthesiology now recommends that all patients with intubated tracheas should be monitored with continuous capnography, be they in operating theatres, ICUs or EDs, or outside hospital.[4]

2) Aspiration was the most common cause of airway-related deaths at the hands of anaesthetists

Aspiration accounted for 17% of primary anaesthetic airway problems and 50% of anaesthesia deaths. It is recommended that aspiration risk be routinely documented for every patient, and when ambiguity exists, a more serious aspiration risk should be presumed. The most common situation in which aspiration occurred was during the maintenance phase of laryngeal mask anaesthesia in patients with risk factors for aspiration. There were a number of cases where rapid sequence intubation (RSI) was clearly indicated but not used. NAP4 recommends that RSI should still be taught despite its limitations – in particular cricoid force can be abandoned if intubation is difficult. Second generation laryngeal masks that feature oesophageal drainage ports were rarely used (10% of all supra-glottic airways), however NAP4 proposes that these might be a safer choice if used in patients judged to have a small, but not zero, aspiration risk.

3) Anaesthetists were poor at performing emergency cricothyroidotomy

There were 58 emergency cricothyroidotomies performed in the operating room, and only 16% of them failed. However, of the 25 attempted by anaesthetists, 16 (64%) failed, 11 of which were thankfully rescued by surgical colleagues. There are two confounding factors worth considering – the first is that anaesthetists were probably forced to attempt cricothyroidotomy in the more serious upper airway obstructions, as, if time allowed, one imagines most anaesthetists would wait for a surgeon to arrive. Secondly, anaesthetists almost exclusively chose techniques involving a narrow-lumen cricothyroid cannulae (which was either ventilated down using a high pressure source, or was the first stage in a Seldinger technique to introduce a wider bore airway). In contrast surgeons preferred an open technique using a scalpel and / or blunt dissection to open the airway. All airway practitioners should be prepared to perform a surgical airway if required. The reasons for, and possible remedy of, the poor performance of emergency cricothyroidotomies by anaesthetists must be addressed.[5]

These three points, while important, do not do justice to the breadth and wisdom of the other lessons and recommendations within the NAP4 report. The original NAP4 document can be found in its entirety, free of charge online. Recommendations are grouped by topic, discussed with clear reasoning and are illustrated by chilling case examples. The NAP4 committee has also created educational podcasts that are available free from iTunes or the NAP4 website.

The Role of Videolaryngoscopy in Airway Management

Videolaryngoscopy (VL) has been met with enormous enthusiasm. As a rescue device after failed DL, there are now numerous papers citing greater success rates than what has historically been reported with persistent DL.[6] However, unlike DL, the weaknesses of VL are poorly understood. If VL is to become the routine first-choice laryngoscope, then it should have a proven higher success rate and lower complication rate than DL. If VL is to be selectively used, then we should be clear in what situations VL is helpful, and in which cases another device is likely to be more successful.

Evidence-based conclusions about VL are hampered by –

1. The absence of a standardised method of describing the level of difficulty of VL intubation (ie unlike DL, a Cormack-Lehane grade I or II view does not consistently mean an easy intubation)
2. The diversity of instruments on the market
3. The limited number of prospective studies involving patients with truly difficult airways, due to the ethical limitations of such studies and the rarity of such patients

The largest VL case series to date was published by Aziz and colleagues in Anesthesiology last year.[7] In their retrospective audit on the use of the Glidescope (GS) in two institutions over two years, they looked at 71,500 intubations, which included 2,044 GS intubations.

Aziz reported that in 576 cases of patients without predictors of difficult DL, the GS failed to achieve intubation 2% of the time. In 1,428 cases of patients with features of predicted difficult DL, the GS failed 4% of the time. When the features of the 60 failed GS patients were analysed, somewhat surprisingly the presence of reduced tissue mobility (such as patients with neck scars, radiation or masses) was the highest predictor of failure, followed by having a thick neck, a short TM distance and reduced cervical neck motion. What is clear from this study is that predictors of difficult DL may cross over to also be predictors of difficult VL. Furthermore, when VL failed, the most common form of rescue was DL (39%), followed by fibreoptic intubation (23%). In my view this study suggests that VL should still be considered as synergistic with, and not a replacement for, advanced DL and fibreoptic skills.

International difficult airway algorithms call for the use of an alternate device when DL has failed, but there is currently no specific mention of the role of VL.[8,9,10] The American Society of Anesthesiologists, Canadian Airway Focus Group, and the ANZCA Airway SIG are all currently working separately on rewriting guidelines for management of the difficult airway, and it will be interesting to see what conclusions will be made about VL. In the meantime I think that it is best to stick to what we already know. Firstly, in cases of failed intubation the provider must choose an alternate but familiar approach that addresses the reason, anatomic or otherwise, for failure of the primary approach. And secondly, prolonged and multiple attempts at intubation cause patient harm and should be abandoned in favour of other methods of oxygenation.

Apnoeic Oxygenation with Nasal Prongs

Finally, I would like to talk about a small and inexpensive trick that may improve safety during intubation – the use of high-flow oxygen via standard nasal prongs.

Quite simply, standard nasal prongs are placed on the patient and oxygen is delivered continuously during otherwise standard airway management. If the patient is conscious, they are set to 4-6 litres per minute. The patient is pre-oxygenated in the usual fashion via a face-mask that is placed over the nasal cannula. Once the induction drugs are given, or if the patient is already unconscious, the nasal oxygen is turned up to 10-15 litres per minute. If required, bag-mask ventilation is performed with oxygen supplied by both the face-mask and nasal prongs. If the patient is having an RSI, a good jaw thrust and continuous application of the face-mask should be used while fasciculations are waited for, in order to facilitate continuous mass diffusion of oxygen into the lungs. Intubation is then attempted with oxygen still flowing through the nasal cannula. Obviously, for this to work, a patent upper airway is needed, and in some cases nasal trumpets (nasal airways) may be used. The few small studies supporting this practice describe a delay in the time till oxygen desaturation by 1.5-3 minutes in normal[11] and obese[12,13] patients. Some practitioners now argue that the traditional practice of removing all oxygen sources during airway management cannot be justified with such a cheap and easy alternative.

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