

Surgical intervention during a Can't Intubate Can't Oxygenate (CICO) event: Emergency Front-of-neck Airway (FONA)?^{††}

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Airway management is a critical element of a number of medical specialities, notably anaesthesia, intensive care, emergency medicine and head & neck surgical disciplines. The vast majority of airways are managed uneventfully using basic and advanced techniques and equipment, so that fortunately, it is rare to find oneself in a 'Can't Intubate Can't Oxygenate' (CICO) situation. CICO arises when attempts to manage the airway by tracheal intubation, face mask ventilation or placement of a supraglottic airway device have all failed. Hypoxic brain damage and death will result unless there is a rapid resolution¹. Published strategies exist to guide airway management including CICO, and whilst such guidance has typically remained the preserve of anaesthetists, surgical input into failed airway management is likely to be needed in the majority of CICO events. A recent clinical case prompted HM Coroner to question whether all relevant clinicians, who may be involved in such rare cases, are aware of what current guidelines had been produced and by whom. This prompted a multispeciality short-life working group to examine how clear airway guidelines can be disseminated to all clinicians who may be involved in emergency airway management. This editorial jointly published in *Clinical Otolaryngology* and the *British Journal of Anaesthesia*, forms part of the response to HM Coroner. It should be made clear that the guidance discussed in this paper is specific to the UK and is not directly relevant to the management of paediatric airway emergencies.

The UK Difficult Airway Society (DAS) first published guidelines for the management of the unanticipated adult difficult intubation in 2004¹. These were revised in November 2015², prompted in part by the findings of the 4th National Audit Project of the Royal College of Anaesthetists and The Difficult Airway Society (NAP4)^{3,4}. The DAS publications and NAP4 are not only of interest to

anaesthetists, but to all doctors who may be called upon for emergency airway management. However, whilst the absence of guidance from other specialties makes the DAS publications more important, there was no formal dissemination to specialties beyond anaesthesia.

Whilst anaesthetists manage the vast majority of difficult airway management issues, those cases that develop into CICO and require 'front-of-neck airway' (FONA) are often multidisciplinary in nature and will usually involve surgical specialties. Surgeons may be already intimately involved in the airway procedure or be immediately available in the case of a predicted difficult airway. Surgeons may also be called to cases of failed airway management anywhere in the hospital from the operating theatres to the intensive care units (ICUs) and Emergency Departments. The majority of cases will not have been discussed with the surgical team, so there will be no clear airway strategy agreed between the eventual bedside team, who may not have even met prior to convening at a life-threatening emergency. Events may take place out of hours and increasingly, senior and middle grade surgical on-call staff, cover much wider geographical areas. These events require clear communication and joint understanding of the goals of airway management, along with a sense of common purpose. Two key issues are apparent in these difficult situations: the timing of FONA and the most appropriate technique.

Changes in practice related to the performance of 'routine' tracheostomy complicate discussion of the most appropriate technique to use for FONA. Twenty years ago, all candidates for the Fellowship in General Surgery would have been expected to demonstrate knowledge of how to perform a tracheostomy. With increased subspecialisation, this is no longer the case. In addition, as highlighted by the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) tracheostomy report, 'On the right Trach?', the majority of tracheostomies in the UK are now performed percutaneously by intensivists, on critically ill patients in our ICUs⁵. This has resulted in reduced exposure of surgical trainees to 'straightforward' elective tracheostomy⁶. Intensivists' practice may vary locally, but most will seek assistance

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from a surgical colleague when percutaneous tracheostomy is likely to prove difficult, such as the obese, those with neck injuries, difficult anatomy or coagulopathies. These comorbidities also make surgical tracheostomy more difficult, especially for a junior surgical trainee.

'On the right Trach?' told us that 70% of new tracheostomies in England and Wales were performed percutaneously⁵. Of the remaining surgical tracheostomies, the vast majority (87%) were carried out by ear, nose and throat (57%) or oral and maxillofacial (30%) surgeons. Overall, 47% of these open procedures were carried out by consultants and 41% by senior surgical trainees. This would suggest that surgical specialist trainees in the early years of training have very limited experience in elective tracheostomy and may not have enough experience to carry out an emergency or 'crash' tracheostomy. However, whilst a successful surgical tracheostomy provides a definitive and secure airway, this may not be the technique of choice when rapid oxygenation is required.

When airway management fails, the final common pathway is a front-of-neck airway. The original 2004 DAS guideline recommended either needle cricothyroidotomy or surgical cricothyroidotomy in the event of 'CICO'. However, NAP4 provided detailed commentary on a series of attempted emergency cricothyroidotomies and concluded that needle or cannula cricothyroidotomy performed by anaesthetists had a particularly low success rate^{3,4}. A narrow-bore cannula also requires use of a high-pressure source to drive oxygen through the narrow cannula and facilitate oxygenation. The attending anaesthetists may have little or no practical experience of the technique, which requires specific equipment and carries a risk of barotrauma to the lungs and soft tissues. Knowledge gaps (how equipment works), system failures (availability of equipment and personnel), technical failures (inability to site a cannula in the airway) and device failures (during or after placement) compounded problems with needle cricothyroidotomy and these findings were, at least in part, responsible for the revision of the DAS guidance.

The DAS 2015 guidelines make a case for a standardised approach to FONA with scalpel cricothyroidotomy as it is judged to be most likely the fastest and most reliable method of securing the airway.^{2, 7-9} This latest guidance has removed needle or cannula cricothyroidotomy from the management algorithms and recommends scalpel-bougie technique with the insertion of a small, cuffed tracheal tube passed over a bougie. Tracheostomy is not suggested as an option for a number of reasons. Firstly, the majority of anaesthetists have limited or no experience of performing surgical tracheostomy, although some will be skilled in the performance of percutaneous tracheostomy. More importantly, a scalpel

cricothyroidotomy is likely to be quicker and safer in a situation of critical hypoxia. The priority is oxygenation of the patient and a 'definitive' airway can be secured subsequently. Scalpel-bougie cricothyroidotomy was selected because it can be performed using equipment available at almost every location where an anaesthetic is performed. The insertion of a large-bore cuffed tube provides a degree of protection against aspiration, an unobstructed route for exhalation and the ability to monitor end-tidal CO₂. The guidelines make it clear that there are other valid FONA techniques which may continue to be provided in some hospitals where additional equipment and comprehensive training programs are available. However, a compelling case is made for standardisation of this final common technique in the management of CICO situations and that scalpel cricothyroidotomy should be learned and regularly rehearsed by all anaesthetists.²

So whilst this FONA guidance is directed specifically at anaesthetists, attending clinicians from other specialties may have considerable experience in the practice of tracheostomy. Where does that leave a surgeon confronted with a patient who is rapidly becoming hypoxic and whom an anaesthetist is unable to intubate or oxygenate? It is clear that some form of 'surgical airway' is required. Whilst recommending scalpel cricothyroidotomy in these circumstances, the updated DAS algorithms are explicit in their disclaimer: *'It is not intended that these guidelines should constitute a minimum standard of practice, nor are they to be regarded as a substitute for good clinical judgement'*. What technique is employed remains at the discretion of the person who has been charged with the provision of the surgical airway. They must base that decision on their own personal experience and the details of the individual case with which they are presented. For an experienced surgeon who has performed numerous emergency tracheostomies, the procedure can be performed in less than five minutes and provide a definitive airway. However, this may not be the case for the trainee or even the consultant surgeon, especially if tracheostomy is not part of their specialist practice. In the setting of critical hypoxia and a peri-arrest event, even 5 minutes to perform a tracheostomy may be too long. In a review of medicolegal cases from the USA, most FONAs were performed at the point of cardiac arrest or death and in over 60% of cases where there was a CICO event, a surgical airway was obtained but was too late to avoid a poor outcome¹⁰.

For most anaesthetists, many surgical trainees, and the majority of non-head and neck specialist surgical consultants, it may be more expedient to carry out a scalpel-bougie cricothyroidotomy when confronted by most patients in CICO. Even for experienced airway surgeons in a peri-arrest situation, this may also be the case. This is based on the easy

anatomical landmarks and the close proximity of the cricothyroid membrane to the skin, which should enable a minimally traumatic access to the airway and allow oxygenation via low-pressure ventilation. Unfortunately, little training has been devoted to the performance of scalpel-bougie cricothyroidotomy (beyond emergency airway training courses for anaesthetists) and it is important that all specialties involved in the management of airway emergencies invest in targeted training to ensure adequate expertise is widely available.

Human factors and team dynamics are always important in the management of crises.³ The 2015 DAS guidelines direct the team to declare the progress as the emergency develops, such as, 'This is a failed intubation', or 'This is a 'can't intubate, can't oxygenate situation'. Surgeons arriving at a failed airway event need to understand clearly what this means and that a request for FONA, a surgical airway or just 'help' is going to require an immediate scalpel-bougie cricothyroidotomy in the vast majority of situations. Departments should plan prior multidisciplinary team rehearsals and equipment must be provided in appropriate locations. The time to first discuss and decide the most appropriate technique and equipment is not when confronted with a profoundly hypoxic patient. There is an RCoA/DAS Airway Lead in every UK hospital who could be responsible for the coordination of such multidisciplinary rehearsals.

When faced with CICO patients, all attending staff should be familiar with common airway management algorithms and understand what different team members are trying to achieve at key time points during airway management. Whilst guidelines remain simply a 'guide' for most, in any emergency it is imperative that techniques employed are ones that an individual feels comfortable with and confident in. Clear communication is essential during these difficult emergencies and the attending surgeon must understand their role and be prepared to perform the most appropriate FONA technique, without delay, taking account of their skills and the clinical circumstances. The Difficult Airway Society has been tasked with producing summary guidance relevant for surgeons, and clinicians who may be involved in managing airway emergencies are advised to familiarise themselves with current algorithms. In the future, formal communication of guidelines between colleges and societies will be encouraged where there is the potential for overlap between specialties.

In the best interests of public health, this paper is published in both Clinical Otolaryngology and the British Journal of Anaesthesia.

Conflict of interest

A.J.H.: expert witness to HM Coroner in index Inquest; expert witness (instructed by family) in 2nd Inquest (ongoing); Editorial Board member, Anaesthesia since 2009, Chair since 2014 National Institute of Academic Anaesthesia Board, since 2014. T.M.C.: Associate Editor of the British Journal of Anaesthesia. L.B.: Board of Directors, British Journal of Anaesthesia. Other authors: No relevant conflict of interests to declare.^{**}

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