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Review

Management of the airway in maxillofacial surgery: part 1

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Abstract

In part 1 of this review of management of the airway in maxillofacial surgery we discuss preoperative assessment of the airway, and the practical means to deal with difficulties. We review the evidence for videolaryngoscopy and flexible indirect laryngoscopy, together with surgical access to the airway including tracheostomy, cricothyroidotomy, and submental intubation.

Keywords: Airway management; risk factors; intubation; laryngoscopy; tracheostomy

Several influences have shaped the evolution of airway management since the turn of the century. In the early noughties, and more recently, the American Society of Anesthesiologists (ASA) and the United Kingdom Difficult Airway Society (DAS) published guidelines for the management of unanticipated difficult intubation in adult, non-obstetric patients.[1–4] During this period, the consequences of failed management of the airway were thrown into stark relief by two high-profile, airway-related fatalities,[5,6] and the findings of the fourth national audit project (NAP4) of the Royal College of Anaesthetists and Difficult Airway Society.[7]

NAP4 was a 12 month, UK-wide prospective audit of morbidity and mortality related to management of the airway. Major contributory factors included poor judgement and a lack of education and training, which was reflected in poor assessment of the airway, failure to plan for failure, and the use of inappropriate equipment and techniques. Of key relevance was the fact that 72 of the 184 reported cases were patients with acute or chronic conditions of the head, neck, or trachea. This two-part review will set out the technical and non-technical aspects of management of the airway for patients who require maxillofacial surgery.

Preoperative assessment of the airway

Assessment of the airway requires consideration of the patient's history, examination, and relevant investigations to answer the questions: Can the patient's airway be maintained during anaesthesia? Can instruments be passed down the patient's airway and, if necessary, will laryngoscopy and tracheal intubation be possible? And, finally, what type of airway is appropriate for the patient and the operation?

Failure to answer "yes" to the first two questions will necessitate consideration of "awake" tracheostomy or "awake" fibreoptic intubation. Findings from clinical history and examination that increase the chance of difficulty with the airway are summarised in Table 1, and the use of imaging is summarised in Table 2.

There is no single finding on examination that reliably predicts a difficult airway, with "at best" correct predictive values of 39%.[8] Several authors have developed scoring systems – for example, the Wilson score,[9] M-TAC score,[10] and Simplified Airway Risk Index (SARI) that quantify and combine some of the findings on examination that are listed in Table 1.[11] However, these scoring systems still have positive predictive values of less than 50%. Despite its limited positive predictive value, however, assessment of the airway is still considered useful.[12] Specifically, early assessment of the airway by a member of the surgical team could identify

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Table 1
Clinical history and findings on examination that may suggest difficulty with the airway.

History	Examination
Previous anaesthetic chart shows difficult mask ventilation or intubation	Reduced mouth opening (vertical inter-incisor distance <30 mm)
"Airway Alert Form" or "Medic Alert" bracelet for difficult airway	Mallampati score of III or IV
Presence and progression of hoarseness, voice change, stridor, dysphagia	Inability to glide the temporomandibular joint forward (upper lip bite test)
Inability to lie flat because of obstruction to the airway/worsening stridor	Reduced atlanto-occipital extension and subaxial flexion
Disease affecting the airway or neck, or both (for example: dental abscess, Ludwig's angina, epiglottitis, carcinoma, arthritides, acromegaly)	Reduced thyromental distance (<6.5 cm; receding mandible)
Craniofacial trauma/burns, injury to cervical spine	Obesity
Congenital syndromes such as Pierre-Robin, Goldenhar, Treacher-Collins, Nagar	Prominent upper incisors
Previous radiotherapy or surgery to neck or floor of mouth	Anatomical abnormality of face, oral cavity, or neck
Symptoms suggestive of obstructive sleep apnoea (STOP-BANG)[13]	

Table 2
Use of imaging in preoperative assessment of the airway.

Imaging	Utility
Radiograph	Not routinely used.
Ultrasound	Screening tool to identify large, midline vasculature before percutaneous tracheostomy.[14] Preinduction identification of cricothyroid membrane.[15]
Nasendoscopy	Inspection of supraglottic airway before anaesthesia to inform airway management – for example, awake or asleep, direct or video, or fibreoptic laryngoscopy.[16]
Computed tomography and magnetic resonance imaging	Level, severity, and extent of airway-related disease. Measurement of the calibre of the nostril is predictive of difficulty in passing the tracheal tube through the nostril (positive predictive value = 71.4%).[17]

a potential or impending difficulty. In doing so, early consideration of the issues by the surgeon and anaesthetist can mitigate any difficulties by reaching a consensus on a suitable strategy for management of the airway.

Laryngoscopy

The glottis may be viewed directly or indirectly to guide tracheal intubation – "blind" tracheal intubation is not recommended.[4]

Direct laryngoscopy

The Macintosh laryngoscope was first used in 1943, and remains the mainstay of direct laryngoscopy. Previous surveys of anaesthetists in the US,[18] Canada,[19] and Northern Europe[20] have pointed to an over-reliance on direct laryngoscopy and a failure to use more appropriate techniques in case of known difficulty with the airway. More recently NAP4 identified a similar behavioural pattern among anaesthetists in the UK in that there was a reluctance to use "awake" fibreoptic intubation when indicated, which may reflect a lack of skill and confidence, or poor judgement.[21]

Videolaryngoscopy

Advances in rigid fibreoptic and digital imaging technology have resulted in an exponential growth in the availability and utility of rigid, indirect laryngoscopes, also known as videolaryngoscopes or optical stylets. A survey of UK anaesthetic departments (which had a 67% response rate) showed that over 90% of respondents had access to at least one type of videolaryngoscope, most commonly the Airtraq® (Prodol Meditec SA), Glidescope® (Verathon, Bothell) and C-MAC® (Karl Storz Endoscopy).[22] This confirms the previous findings of Gill et al,[23] and suggests that these particular devices are becoming part of anaesthetic practice in the UK. However, the best evidence has suggested that videolaryngoscopy is not yet the predominant mode of laryngoscopy in the UK, although that is the case in some departments.[24]

In terms of practical use, a recent Cochrane review analysed data from 64 RCT (7044 participants) that compared videolaryngoscopy with Macintosh direct laryngoscopy.[25] The authors concluded that videolaryngoscopy improved the view of the glottis, and reduced the incidence of failed intubation, postoperative hoarseness, and laryngeal trauma. However, there was no evidence that videolaryngoscopy was associated with fewer attempts at intubation, a reduced incidence of sore throat, or a reduced incidence of hypoxia or respiratory complications. Of note, the authors pointed out that the videolaryngoscopes included in their review were not equally useful. Though this has not been confirmed, expert opinion has suggested that different videolaryngoscopes may be suited to different "problems" with the airway.[26]

Flexible indirect laryngoscopy

It is widely recognised that fibreoptic intubation plays an important part in the management of predicted difficulty with the airway.[2,4] In contemporary practice the fibrescope is used in "awake" fibreoptic intubation, or in anaesthetised patients with or without a supraglottic airway as a conduit (low-skill fibreoptic intubation, and "asleep" fibreoptic intubation, respectively). Apart from low-skill fibreoptic intubation, nasotracheal intubation is typically chosen as it is

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