

Unusual Pre-oxygenation Techniques and Transorbital Fibre-optic Intubation

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Extensive maxillo-facial surgery can create significantly complex airway anatomy. We present the case report of a 31-yr-old female presenting for elective day case surgery. She had a past medical history of Asperger Syndrome and T4 N0 spindle cell sarcoma of the left maxilla for which she had a left orbital exenteration and maxillectomy and left-sided neck dissection in 2004 with no anaesthetic complications. This was accompanied with post-operative radiotherapy which had left her with severe radiation trismus. Her American Society of Anaesthesiologists (ASA) grade was II and airway assessment found that she had moderate neck flexion and extension with a thyromental distance of 6.5 cm. However, mouth opening was restricted to less than 1 finger and there was no mandibular protrusion. Her nasal passages were collapsed and distorted externally.

Her prosthetic eye was removed and pre-oxygenation was achieved using a DuoDERM dressing (ConvaTec Inc.) to occlude her left orbital cavity to

prevent any air leak. Due to her level of autism, and documented evidence of previous easy facemask ventilation, it was agreed that an awake fibre-optic intubation would neither be required nor appropriate. Given the unfamiliarity with her abnormal oral and nasal airway anatomy we utilized a flexible fibre-optic scope to perform an asleep transorbital intubation to secure a definitive airway for surgery.

This impossible oral access presents a challenge to the anaesthetist putting restrictions on the function of any laryngoscope. Fibre-optic intubation was first described in 1967 and is the gold standard approach for the anticipated difficult airway. The fourth National Audit Project (NAP4), which examined airway complications in the United Kingdom, identified a number of cases where awake fibre-optic intubation may have been beneficial over the chosen technique. Structurally unusual airways often require some unconventional initiative but this cannot replace thorough pre-operative planning and communication to prioritize patient safety.

Key Words: Maxillo-facial surgery; Laryngoscope; Pre-oxygenation; Transorbital fibre-optic Intubation

INTRODUCTION

Extensive maxillo-facial surgery can create significantly complex airway anatomy. Furthermore, adjunctive head and neck radiotherapy can produce serious side effects in patients such as trismus. This very limited mouth opening can progress to be so severe that the patient becomes debilitated due to lack of nutrition [1]. This impossible oral access also presents a considerable challenge to the anaesthetist putting absolute restrictions on the function of any laryngoscope. The American Society of Anaesthesiologists Task Force defines a difficult airway as 'the clinical situation in which a trained anaesthetist experiences difficulty with facemask ventilation, supraglottic device ventilation, tracheal intubation, or all three' [2]. It is within every anaesthetist's basic training that they learn to identify risk factors for a difficult airway and alternative options to manage these to reduce the risk of adverse outcomes. Facemask ventilation is a vital step in the difficult airway algorithm, with patients dying as a result of hypoxia rather than the inability to intubate. We report a case of a 31-yr-old female, with a history of radical left maxillectomy with orbital exenteration and severe radiation-induced trismus, scheduled for elective orbital implant surgery. Her prosthetic eye was removed and vital pre-oxygenation was achieved using a DuoDERM dressing (ConvaTec Inc.) to occlude her left orbital cavity to prevent any air leak. Given her impossible oral access, an asleep trans-orbital fibre-optic intubation was performed to secure a definitive airway for surgery.

CASE REPORT

This was an interesting case of a 31-yr-old female, with written consent, whom had attended for elective maxillo-facial revision surgery. She had a past medical history of Asperger Syndrome and T4 N0 spindle cell sarcoma of the left maxilla for which she had a left orbital exenteration and maxillectomy and left-sided neck dissection in 2004 with no anaesthetic complications. This was accompanied with pre-operative chemotherapy and post-operative radiotherapy. Her American Society of

Anaesthesiologists (ASA) grade was II and airway assessment found that she had moderate neck flexion and extension with a thyromental distance of 6.5 cm. However, mouth opening was restricted to less than 1 finger and there was no mandibular protrusion. Subsequent post-operative radiotherapy had left her with severe facial fibrosis in the left medial pterygoid and temporalis muscle. On the day of the surgery, the anaesthetic team had received no prior warning of this patient's unique airway and she was only seen an hour pre-operatively. We had access to some electronic clinic notes, some previous anaesthetic charts and imaging. It was felt that progressive altered anatomy from multiple surgeries meant conventional oral or nasal intubation would be impossible. Given her level of autism, and documentary evidence of previous easy facemask ventilation from previous anaesthetic charts, it was agreed that an awake fibre-optic intubation would neither be required nor appropriate. From previous imaging we could identify a connection between the nasal cavity and the orbit potentially creating a big leak making facemask ventilation very difficult. On examination her fringe moved during speech indicating some expiratory airflow through the orbit. During the examination it was vital to remove the prosthesis to appreciate the extent of previous surgery. The patient was successfully pre-oxygenated using a DuoDERM hydrocolloid dressing to seal the orbit defect. The patient was able to confirm a good seal, plus there was a slight but visible rise and fall of the centre of the dressing. After adequate induction medication with Propofol (2-3 Mg/Kg) and Fentanyl (1 Mcg/Kg) we facemask ventilated to check good airway control then delivered Rocuronium (0.6 Mg/Kg) with Sugammadex available in close proximity. Capnography and end tidal oxygen confirmed successful face mask ventilation and her oxygen saturations remained 100% throughout. Once the train of four was <20% we passed the fibre-optic scope loaded with a standard 6.5 mm endotracheal tube through the orbit. It passed easily through the nasopharynx in to the larynx. Once the carina was visualised, the endotracheal tube was placed without any difficulty and secured at 22 cm at the edge of the orbit using adhesive tape. The surgery proceeded as

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planned and extubation was uneventful. The patient will now be scheduled for bilateral coronoidectomies to improve oral access both for improvement of the patient's nutritional status but also to make conventional oral intubation an option again for inevitable future surgeries.

DISCUSSION

Predicted difficult airways require good pre-operative planning and facemask ventilation is an essential part of the algorithm. In previous cases prostheses have masked difficult airway management issues and have been the cause of surgery to be abandoned [3]. Maintenance of airway patency and oxygenation are the main objectives of facemask ventilation. There have been documented cases of patients who have been anaesthetised as normal then woken up immediately as the anaesthetist had failed to recognise and appreciate the obscure anatomy causing difficult facemask ventilation [4]. This was an interesting reminder that patients with extensive reconstructive facial surgery may require some thought and ingenuity.

It is useful to understand that eye prosthesis must be removed and a seal created to be able to mask ventilate. In an emergency scenario, if a dressing is not available, then an unconnected defibrillator pad is the correct size and adhesiveness. However, a nose prosthesis should be kept on to improve the fit of the facemask.

Knowledge of adaptive methods with difficult airways is vital for patient safety. However, the familiar oral and nasal airway adjuncts were inappropriate for this patient's airway. This only left fibre-optic intubation or surgical airway. There was also a discussion between the anaesthetic team and the surgeons regarding emergency planning for a difficult ventilation and intubation scenario and how we would manage this with front of neck access if required. This is not the first time these novel airway management techniques, described in the case report, have been described in the literature [5,6].

Complicated head and neck patients often have progressively changing airways with multiple surgeries. Postoperatively, we found out that this patient had previously undergone nasal reconstruction surgery to open up her left nostril in 2012 to create a clear passageway later confirmed by nasendoscopy. The patient had also been supplied with a supporting anaesthetic letter for this to be clearly communicated with future anaesthetic teams. However, none of this information was available at the time of surgery. Ideally, these complex patients should have the same teams or, at least, clear anaesthetic plans to assist in airway management decision-making for continuity of care and patient safety.

Fibre-optic intubation was first described in 1967 and is the gold standard approach for the anticipated difficult airway [7]. It is traditionally a technique which allows a small, flexible endoscope to be passed down the oral or nasal route to provide clear visualisation of the larynx and vocal cords in to the trachea under direct vision. There are different indications for awake and asleep fibre-optic intubation. Keeping a patient awake has the benefit of maintaining spontaneous ventilation and protection of the airway. This is important in the anticipated difficult airway including previously documented airway difficulty, aspiration risk and risk of iatrogenic injury including unstable c-spine. The fourth National Audit Project (NAP4), which examined airway complications in the United Kingdom, identified a number of cases where awake fibre-optic intubation may have been beneficial over the chosen technique [8]. However, there is certainly less popularity with awake fibre-optic intubation for a variety of reasons including inexperience and fear of patient distress and recall.

There are very few contraindications to awake fibre-optic intubation, but they include patient refusal, local anaesthetic allergy and, in our case, inability to cooperate. The majority of the trans-orbital fibre-optic intubations found in the literature were performed awake. Our patient had clear documentation of easy facemask ventilation and her autism meant that she would not tolerate an awake fibre-optic intubation therefore it was a calculated subjective opinion to proceed with an asleep fibre-optic intubation.

In conclusion, this case report should be a reminder that thorough, accurate history taking, reviewing of patient notes and imaging, and careful examination of the airways will improve the understanding of patients' individual anatomy. This will, in turn, prevent unnecessary patient risk and reduce reliance on old anaesthetic charts to guide our airway management plans. These decisions rely on comprehensive pre-operative assessments, the patient's past medical history, the equipment available, and the experience of the anaesthetic team. Most importantly, the theatre team should be aware of, and be available for, an alternative contingency plan making patient safety absolutely paramount.

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COMPETING INTERESTS

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