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Emergency tracheal catheterization for jet ventilation: a role for the ENT surgeon?

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Abstract
Stridor causing respiratory failure is an ENT and anaesthetic emergency requiring prompt management to secure a clear airway. We describe a case of subacute partial upper airway obstruction due to a large laryngeal carcinoma in an 81-year-old male resulting in respiratory failure. The patient became apnoeic after gaseous induction of general anaesthesia, and after two failed intubation attempts an emergency transtracheal airway catheter was placed by the surgeon under direct vision below the cricothyroid membrane, as this had tumour involvement. The patient was subsequently manually jet-ventilated with ease until a formal tracheostomy was made. Where difficulties with tracheal anatomy are encountered due to the presence of pathology, the insertion of a temporary airway catheter for jet ventilation by the surgeon can buy valuable time and be life-saving.

Key words: Airway Obstruction; Trachea; High Frequency Jet Ventilation; Anaesthesia

Introduction

Stridor causing respiratory failure is an ENT and anaesthetic emergency requiring prompt management to secure a clear airway. Where anatomy is altered by the presence of significant pathology, the attainment of a successful outcome becomes more difficult. In particular, successfully intubating the larynx may be harder for the anaesthetist, while tracheostomy formation can be more demanding for the surgeon. The pressure to perform these functions quickly in the presence of hypoxia adds to the challenge. Successful management requires good co-operation between the surgeon and the anaesthetist. We describe a case of subacute partial upper airway obstruction due to a large laryngeal carcinoma in an 81-year-old male, whose initial airway management required such an approach.

Case report

An 81-year-old man with a 2-month history of squamous cell carcinoma of the larynx (T3, N1) was referred acutely to the hospital by his general practitioner with a history of increasing stridor. On examination, the admitting ENT senior house officer (SHO) noted the patient had marked stridor with hypersecretion and dyspnoea. Fibre-optic nasoendoscopy confirmed a very narrow airway (approximately 4 to 5 mm in diameter at its narrowest point) with irregularity of the right laryngeal inlet and gross oedema. An ENT decision was made to perform an emergency tracheostomy and the patient was taken to theatre breathing heliox (21 per cent oxygen, 79 per cent helium). A team of two consultant anaesthetists and an ENT specialist registrar and SHO were in theatre by the time the patient arrived. The patient was transferred onto the operating table maintaining his favoured upright position. He was given 200 μg of glycopyrronium intravenously as an antisialogue and the skin over the upper tracheal rings was infiltrated with local anaesthetic (20 ml bupivacaine 0.5 per cent with 1 in 200 000 epinephrine). The patient found the skin infiltration very distressing and suffered increasing exhaustion. It was noted that there was distortion of the anterior neck anatomy with tumour palpable anterior to the trachea below the larynx. Thus the preferred option of awake tracheostomy under local anaesthesia alone appeared very difficult. The decision was therefore taken to induce general anaesthesia.

A gas induction with the volatile agent, sevoflurane, was attempted. However, while the airway was reasonably maintained, an adequate depth of anaesthesia was not achieved. Therefore the sevoflurane was stopped and substituted with halothane. This resulted in a better level of anaesthesia but as the halothane was increased the patient became apnoeic. Two attempts were made to intubate the trachea by direct laryngoscopy with a McCoy blade and a size 4.0 cuffed microlaryngoscopy tube. On both occasions, the tube could be passed into a bubbling orifice but no discernible ventilation could be detected either clinically or on capnography. Thus the tube was removed on both occasions. Between attempts, the surgeon was asked to start the tracheostomy and bag and mask ventilation was attempted which proved impossible.

Needle cricothyroidotomy was now considered by the anaesthetists as the rescue technique of choice. The cricothyroid membrane was found to be involved with tumour but the surgeon had incised the skin by this time and gained a view of the trachea. The presence of a large overlying vein hindered immediate tracheostomy and so an emergency transtracheal airway catheter (6.0 French gauge, 7.5 cm length, Cook) was inserted under direct vision by the surgeon between the level of the 2nd and 3rd tracheal rings. A manual jet ventilator (Manujet, VBM

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medizintechnik GmbH) was connected and the patient was ventilated with ease, with the obvious and audible expiration of gas through the stenosed larynx. The oxygen saturation quickly rose from its low point of 75 per cent to 95 per cent. The patient was ventilated thus for approximately 10 min while the surgeon proceeded to make the tracheostomy passing a size 7.0 flexible flange tube. The patient was subsequently woken and recovered.

Discussion

In an anaesthetic editorial on the management of the obstructed airway in head and neck surgery,[1] it has been stated that patients with severe stridor, a large tumour or gross anatomical distortion should have a preliminary tracheostomy performed under local anaesthesia. In correspondence which followed this article,[2] it was suggested that the need for general anaesthesia may have to be reconsidered where tracheostomy under local anaesthesia may be technically difficult in a patient with an airway partially obstructed by tumour. However, our experience bears out the risks of undertaking such an approach as evidenced by the fact that apnoea occurred under halothane anaesthesia, with the subsequent inability to intubate and ventilate.

- **Establishing an adequate airway in the presence of partial obstruction is a problem that requires close co-operation between anaesthetist and surgeon**
- **This is a case report of a patient with a laryngeal malignancy with stridor and with respiratory failure**
- **A transtracheal catheter was placed which allowed jet ventilation while a formal tracheostomy was performed**
- **This manoeuvre bought valuable time and the authors recommend it as a life-saving strategy in such cases**

The answer as to how best to manage such a case as this may be similar to what finally happened. Percutaneous transtracheal jet ventilation (PTJV) has come to be accepted as a tried-and-tested technique which can be employed in an emergency where a 'can't intubate, can't ventilate' situation occurs.[3] However, PTJV is not always easy to perform. Not only is inserting a catheter through the cricothyroid membrane for PTJV in a patient who is developing asphyxia a major challenge,[4] but when the anatomy is distorted by the presence of pathology this challenge becomes even greater. Indeed, inability to locate the cricothyroid membrane and severe pre-tracheal tissue distortion, through which a cannula would be too short to penetrate, are cited as contraindications to transtracheal jet ventilation.[3]

Our case illustrates that correct insertion of a catheter for transtracheal jet ventilation can be facilitated by having the trachea in direct view at operation when a degree of anatomical distortion is present, allowing successful transtracheal jet ventilation to occur. In our review of the literature, we have found no other case where transtracheal jet ventilation has been used in this manner. This is a procedure, which could be performed under local anaesthesia with an appropriate amount of surgical dissection of the pre-tracheal tissues prior to a formal tracheostomy being made. The use of prophylactic transtracheal catheterization under local anaesthesia for the purpose of jet ventilation where there is a high risk of hypoxia is already established in anaesthetic circles,[5] Once transtracheal jet ventilation has been established the need for sedation/general anaesthesia could be considered and achieved with greater security, subsequently allowing the formation of a formal tracheostomy in a more controlled and safe manner.

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