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Airway crisis during anesthesia in a patient with Wegener's granulomatosis

RICHARD H. RILEY[1], DAVID J. KNOX[1], and PAUL YUEN[2]

Departments of [1]Anesthesia and [2]Ear, Nose and Throat Surgery, Royal Perth Hospital, Wellington Street, Perth, WA 6000, Australia

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Introduction

Wegener's granulomatosis (WG) is an inflammatory disease characterised by granuloma formation, vasculitis and necrosis [1]. Life-threatening airway obstruction may be the initial presentation of this disease in some patients [2–6]. We experienced difficult airway management during general anesthesia in a suspected WG patient who underwent diagnostic biopsy of the larynx.

Case report

A 45-year-old woman (ASA class 3E) was scheduled for emergency microlaryngoscopy, examination of the nasopharynx and diagnostic biopsy under general anesthesia. She had been admitted to hospital earlier that day for investigation of stridor. There was a 2-month history of increasing shortness of breath on exertion. There was an associated raspy cough productive of small amounts of white sputum. There was no hemoptysis nor dysphagia. She was a non-smoker. Several months earlier she had been diagnosed as having iron deficiency anemia. Her medications were iron and folic acid.

On examination she was extremely anxious, thin, and afebrile. Her blood pressure was 150/100 mmHg, and the heart rate was 120 beats·min^{-1} and regular. At rest there was some quiet inspiratory stridor with an occasional cough. Her respiratory rate was 16 breaths·min^{-1}. Cardiovascular examination was normal. There was no lymphadenopathy. The electrocardiogram (ECG) was normal and chest X-ray with thoracic inlet views revealed clear lung fields with normal pulmonary vasculature. There was diffuse concentric narrowing of the upper airway in the subglottic region, the cause for which was not apparent but possibilities included thyroid swelling. A computed tomographic (CT) scan performed from the larynx to carina confirmed significant narrowing of the subglottic larynx due to symmetrical mural thickening.

She was reviewed by the ear, nose, and throat (ENT) surgeon who found atrophic rhinitis and erythema of the vocal cord with possible granulomatous disease. A presumptive diagnosis of WG was made. The patient was counseled regarding the possibility of emergency tracheostomy and was fasted in preparation for microlaryngoscopy and biopsy.

On arrival in the operating suite she was extremely anxious and there was no respiratory distress. A non-productive cough and mild inspiratory stridor were present. After placing routine monitors on the patient, a venous cannula was inserted and compound sodium lactate solution was infused. In divided doses, 100 μg fentanyl was given. Following explanation an inhalation induction was performed with isoflurane and nitrous oxide in oxygen. The ENT surgeon was requested to stand by in the event of an emergency tracheostomy. After a deep level of general anesthesia was achieved, laryngoscopy was performed and a good view of the larynx was obtained. The vocal cords appeared normal but some granulation tissue was apparent immediately beyond them. We attempted to pass a 5.0 mm i.d. microlaryngeal tube (Portex, Kent, UK) through the

Address correspondence to: R.H. Riley, Department of Anesthesia, Royal Perth Hospital, Box X2213 GPO, Perth, WA 6001, Australia

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vocal cords but could not, even with a stylet in situ. This maneuver produced a small amount of bleeding. Laryngoscopy was abandoned and manual ventilation with a face mask was performed. After several breaths complete obstruction ensued. Laryngoscopy was performed again and blood clot was removed from the glottis by a Yankauer sucker. Bag mask ventilation could then resume but once again total obstruction ensued. Arterial oxygen saturation (SPO_2) began to fall. The ENT surgeon was alerted while laryngoscopy was again performed to remove blood clot. During preparation for emergency tracheostomy the patient's SPO_2 decreased below 50% and she developed sinus bradycardia. Atropine 0.6mg was given i.v. An emergency tracheostomy was performed via a vertical incision and a 7mm i.d. Portex cuffed tube was inserted without difficulty. SPO_2 resumed to normal levels (99%) and multiple biopsies of extensive soft granulation tissue were removed. Examination of the nasal cavity also revealed granulation tissue which was submitted for histopathological examination. Recovery was unremarkable. Histopathological examination of subglottic tissue showed WG.

Discussion

Anesthetic management of patients with stridor is potentially hazardous. Life-threatening airway obstruction may occur at any time, and the anesthetic plan should allow for this possibility. When subglottic stenosis has been diagnosed preoperatively, the choices of methods for securing the patient's airway are limited. If possible, elective tracheostomy performed below the level of obstruction under local anesthesia is a safe option in a cooperative adult. For those patients who cannot tolerate awake tracheostomy, inhalation induction of anesthesia is frequently performed [7]. Alternatively, slow titration of propofol in combination with opioids and topical anesthesia could also be considered. Helium has been found to be useful during inhalation induction to reduce turbulent flow at the stenotic area [8]. In that case [8], cardiopulmonary bypass (CPB) was set ready for use in case of complete airway obstruction.

Other techniques have also been used successfully in this setting. A transtracheal ventilation technique has been reported for a patient with tracheal stenosis [9]. Here, the author described a technique of placing a Teflon venous catheter under local anesthesia below the site of tracheal stenosis prior to inducing general anesthesia. Ventilation was maintained with manually-triggered intermittent high-pressure insufflation of oxygen via the catheter and anesthesia was induced and maintained with an intravenous technique.

In the extreme situation where any type of airway management is considered to be impossible, or extremely hazardous, extracorporeal circulation techniques may be required. Using local analgesia, there are reports of using a femoral percutaneous technique of CPB before inducing general anesthesia [10–12]. Once CPB has been established, intravenous anesthesia techniques are used prior to beginning surgery on the compromised airway.

In the emergency situation where manual ventilation and intubation are impossible de novo, or have supervened during inhalation induction, transtracheal cannulation, cricothyroidotomy, and tracheostomy are the options. The choice is dependent upon the equipment and technical skills available at the time [13].

In our case, anesthesia was induced via an inhalation technique, initially without incident. The CT scan of the airway had been reviewed by the anesthetist prior to induction of anesthesia. It was considered that the patient's trachea would allow passage of a 5.0mm i.d. tracheal tube. However, when intubation was attempted, it was apparent that the available tracheal tube was too large. Next day, the CT scans were reviewed again and measurements were made. The narrowest portion of the subglottic larynx in the anteroposterior diameter was approximately 7mm, and the transverse diameter was approximately 5mm (Fig. 1). The external diameter of the tracheal tube is stated by the manufacturer to be 7.2mm. In retrospect, then, this was an inappropriate size for this patient's airway.

Next, the attempt at intubation resulted in bleeding from the subglottic granulation tissue. Topical vasoconstrictors could have been used in an attempt to maximize airway size and minimize the risk of bleeding. Blood clot caused total obstruction of the airway and repeated suctioning was needed to allow brief periods of ventilation. However, the bleeding was continuing and hypoxemia was ensuing. A decision to obtain a surgical airway was made and the outcome was favorable. After the first failed attempts at intubation, another maneuver that could have been tried is bronchoscopy with a rigid pediatric bronchoscope. This device could have been used if it had been prepared in advance. It has been recommended that a small rigid bronchoscope always be available to help secure an airway that has become obstructed [13]. The smallest rigid bronchoscope available at our hospital has a diameter of 6.5mm and we doubt that it would have passed through the stenotic region. As requested, the ENT surgeon was in attendance and quickly established a surgical airway.

This case reminds us that tracheal stenosis represents a most difficult airway problem. The anatomy of the compromised airway should be assessed as thoroughly

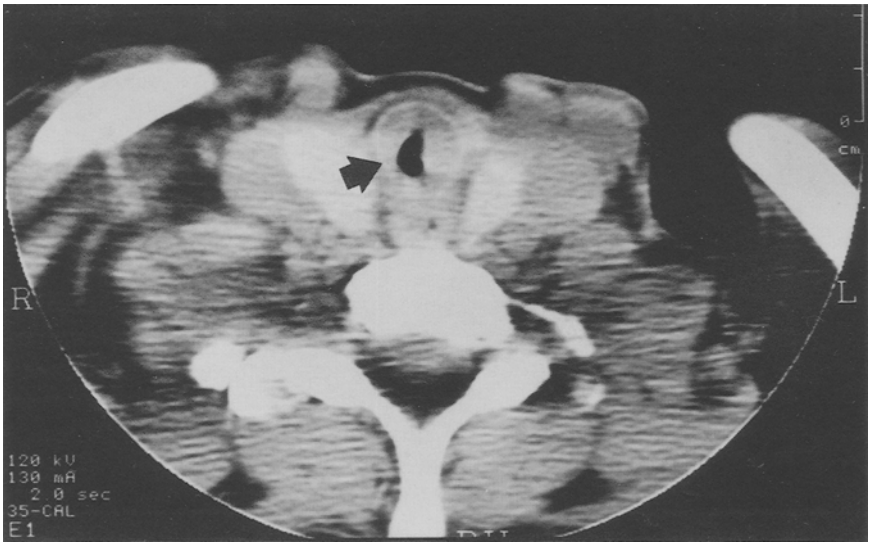

Fig. 1. Computed tomographic scan of the subglottic larynx showing stenosis of the crescent-shaped trachea (*arrow*). The anteroposterior diameter is approximately 7 mm and the transverse diameter is approximately 5 mm

as time will allow. The anesthetist should have a clear plan to cover each possibility during induction of anesthesia. This plan should be communicated to his assistant and discussed with the surgeon in attendance. A selection of small tubes, introducers, and a pediatric bronchoscope must be immediately available. Finally, staff and equipment for urgent tracheostomy should be fully prepared and waiting in the operating theatre. We would urge anesthetists who become involved with patients with suspected or known WG to plan the anesthetic management with extreme care. Wherever possible, biopsy from another site should be considered. If the stenosis is mild, an anesthetic technique that did not involve instrumentation of the airway may be possible. Without a tube or catheter in place, this would result in a larger available natural airway and lessen the likelihood of bleeding or edema.

A recent study of tracheobronchial involvement in WG found that subglottic stenosis was present in 17% of patients, and various degrees of tracheal or bronchial stenosis was present in others [14]. Prior to the introduction of immunosuppressive therapy, WG was regarded as a uniformly fatal disease. General anesthesia may be required in these patients for bronchoscopic examination of the tracheobronchial tree, biopsy of lesions in the airway, intratracheal laser therapy, or for placement of airway stents. In summary, patients with WG frequently have tracheobronchial involvement that may present acute problems for the anesthetist and ENT surgeon.

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