CASE REPORT

Laryngeal tuberculosis: a rare cause of critical airway obstruction

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SUMMARY

Laryngeal tuberculosis (TB) is a rare condition, occurring in less than 1% of patients infected with pulmonary TB. We present a case of a 57-year-old male patient, who presented in extremis with audible stridor, increased work of breathing and cyanosis. In addition, the patient had a complex medical history, including a recent diagnosis of congenital malformation of the epiglottis. Emergency intervention was required to secure the airway, and after initial attempts at intubation were unsuccessful, an emergency tracheostomy was performed. Four days after initial presentation, his sputum tested positive for acid-fast bacilli, and a subsequent CT chest revealed pulmonary as well as laryngeal TB, which was confirmed on biopsy of the larynx. The patient was commenced on a 24-week course of anti-tuberculous treatment and was successfully decannulated 6 months after the emergency airway was established.

BACKGROUND

Laryngeal tuberculosis (TB) is a rare and largely forgotten disease¹ and is easily missed, since there are no pathognomonic symptoms or findings on physical examination.² However, it is now the most common granulomatous disease of the larynx, and most commonly affects men aged 40–60 years. Risk factors for the development of upper respiratory tract TB infection include HIV, smoking, diabetes, recreational drug use, malignancy and the use of immunosuppressive drugs.³

Infection of the larynx most often involves the anterior laryngeal structures and is characterised by hypertrophic, exophytic and/or polypoid lesions. The vocal cords are affected in 50%–70% of cases, and the false cords in 40%–50%.² When severe infection occurs, these key anatomical areas can become inflamed, causing obstruction of the airway. This results in fulminant respiratory distress, which may progress to respiratory arrest if not recognised and managed appropriately.

The rare occurrence of fulminant airway obstruction from TB presented a challenge in this case. We hope that by presenting it to a wide medical audience (it has relevance to medical, surgical and anaesthetic teams), we are able to raise awareness of TB infection as a part of the differential diagnosis in patients with acute upper airway obstruction, and encourage early diagnosis and management. Furthermore, it highlights the importance of using a multidisciplinary team approach in the emergency

management of patients with complex airways, including teams which can bring specialist skills for successful emergency management. Finally, the case highlights the use of the Difficult Airway Society's (DAS) difficult intubation guidelines⁴ in an unusual clinical situation and demonstrates how the guidelines can be used as a tool among team members for guiding clear communication, task allocation and a stepwise plan in order to manage the effect of human factors and enable successful cohesion of the team.

CASE PRESENTATION

A 57-year-old man presented to the emergency department in extremis having been brought in by the London Ambulance Service following an acute onset of stridor and increased work of breathing. There was associated central cyanosis, oxygen saturations of 82% on 15 L/min of oxygen and the patient was cool, clammy and peripherally shut down.

His wife gave a collateral history that in addition to this acute presentation of respiratory distress, the patient had a complex medical background, including a 4-month history of change in voice, and recent diagnosis of a congenital malformation of the epiglottis, diagnosed on nasal endoscopy performed by a consultant ear, nose and throat (ENT) surgeon. The patient's wife produced pictures of the appearance of the epiglottis (figure 1). He furthermore was known to have a patent foramen ovale with associated chronic hypoxia (baseline oxygen saturations of 85%–88% on room air) and a history, since childhood, of recurrent episodes of brittle asthma, for which he had several critical care unit (CCU) admissions and multiple courses of steroids. He had no history of HIV infection or previous TB contact.

On examination, the patient was noted to have features suggestive of a 'difficult airway' with a Mallampati class of 3,⁵ 4 cm mouth opening, a thyromental distance of 7 cm, wide neck circumference and a raised body mass index. He was however known to have been successfully intubated with no difficulties 1 year earlier due to lung contusions following trauma. On examination of his chest, he had widespread transmitted sounds from his stridor, with equal air entry bilaterally.

INVESTIGATIONS

Given the patient's acute and critical presentation, limited initial investigations were performed. An arterial blood gas sample demonstrated type 2

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Figure 1 Images obtained on flexible nasal endoscopy demonstrating curled epiglottis and short aryepiglottic folds.

respiratory failure, with a PaO_2 of 8.5 kPa (on 15 L/min oxygen), PaCO_2 of 11.2 kPa and a resulting acidemia (pH 7.157).

An initial portable chest X-ray was also performed which demonstrated poor inspiratory effort, with some reticular shadowing, particularly in the left upper lobe.

DIFFERENTIAL DIAGNOSIS

Given the complex medical history of this patient, the differential diagnosis was wide and included:

- ▶ Deterioration of known abnormality of larynx, potentially related to the congenital malformation
- ▶ Exacerbation of previously diagnosed 'brittle' asthma
- ▶ Upper airway infection (eg, epiglottitis, laryngitis, retropharyngeal abscess).
- ▶ Upper airway tumour
- ▶ Lower respiratory tract infection

TREATMENT

Acute management

The paramedic crew and emergency department commenced treatment for life-threatening asthma with nebulised salbutamol, intravenous magnesium, intravenous hydrocortisone and aminophylline. As the on-call anaesthetic team, we were called for assistance and administered ceftriaxone and co-amoxiclav to provide prophylaxis in case of epiglottitis or a lower respiratory tract infection. Despite administration of back-to-back epinephrine nebulisers and intravenous dexamethasone, the patient made no improvement, becoming increasingly tired and more hypoxic. The decision was therefore made to anaesthetise, intubate the trachea and invasively ventilate the patient.

Assistance from an ENT surgeon was summoned. The patient was transferred to theatres. The airway management plan was as per DAS guidelines (figure 2). Full monitoring (ECG, invasive blood pressure, oxygen saturations, capnography, gas monitoring) was applied, and the patient was preoxygenated with 100% oxygen via the anaesthetic breathing circuit. After

preoxygenation to an end-tidal oxygen concentration of 90%, a rapid sequence induction of anaesthesia was performed with intravenous ketamine 150 mg and intravenous suxamethonium 150 mg. Videolaryngoscopy (Glidescope) was performed, which revealed a view of the larynx similar to that seen previously via flexible nasendoscopy (figure 1). It was not possible to advance a size 6.0, 5.5 or 5.0 mm endotracheal tube, or a paediatric bougie through the cords. Neuromuscular blockade was maintained with intravenous rocuronium 50 mg and ventilation was attempted with a laryngeal mask airway, which proved to be impossible; bag mask ventilation with an oropharyngeal airway was also impossible. At around 6 min after the start of intubation and reaching a 'can't intubate, can't ventilate' scenario, a decision was made to proceed to a surgical airway, which was performed by the ENT surgeon who was scrubbed and standing in theatre at the time of start of intubation. The tracheostomy was difficult to insert due to the patient's body habitus, but a Portex size 7 tracheostomy tube was successfully inserted through the cricoid and upper three tracheal rings. Correct placement was confirmed by capnography and fibre-optic endoscopy. Oxygen saturations rapidly improved following insertion of the tracheostomy, with normal airway pressures and no wheeze on auscultation of the chest. The patient remained cardiovascularly stable throughout, and was transferred to the CCU, where sedation was maintained overnight. The following day, he returned to theatre for revision of the tracheostomy. Following this, he was woken from sedation, with no neurological compromise.

Longer term management

Sputum samples were found to be positive for acid-fast bacilli (AFB) on fluorescence microscopy (auramine-rhodamine staining) two days post CCU admission (following detection of TB by PCR.) At this point, the patient was isolated and referred to the infectious diseases team. He was commenced on dual antitubercular therapy with Rifinah and pyridoxine the following day. Subsequent imaging of thorax and bowel were undertaken and reported to demonstrate new consolidation with extensive nodules involving the left apex and apical posterior segment of the left upper lobe with early cavity formation.

Given the complexity of his ongoing management, the patient was transferred to the local tertiary centre for ongoing management by the ENT and infectious diseases teams. Three further sputum samples taken here were also positive for AFB and the patient was continued on antituberculous therapy.

During this time, further imaging of the head, neck and larynx was undertaken to assess laryngeal and tracheal anatomy and also to assess for any intracranial spread of TB. Intracranial images were entirely normal. Images of the larynx demonstrated non-specific abnormalities. At the time of the scan, the supraglottis was effaced at the laryngeal vestibule (probably by oedema on the false cord region and medial prolapse of the left aryepiglottic fold), and therefore, the images were difficult to interpret. The epiglottis was narrow in transverse dimension, and curled into a tight C shape. A subglottic stenosis of 6 mm diameter was noted, extending by 1.5 cm down the trachea. These findings were confirmed on MRI scanning.

One month after the emergency tracheostomy, a microlaryngoscopy was performed by a consultant laryngologist and revealed a grossly abnormal larynx, with an oedematous and nodular supraglottis, oedematous vocal cords and oedematous subglottis (figure 3). Multiple biopsies were taken which demonstrated chronic inflammation with poorly-formed granulomas.

Management of unanticipated difficult tracheal intubation in adults

This flowchart forms part of the DAS Guidelines for unanticipated difficult intubation in adults 2015 and should be used in conjunction with the text.

Figure 2 Current Difficult Airway Society guideline flowchart for the management of failed intubation.⁴ Abbreviations: SAD, Supraglottic Airway device; CICO, Can't intubate, Can't Oxygenate.

Following multidisciplinary team discussions between the ENT and infectious diseases teams, the patient continued TB treatment and was isolated until 28 days post starting treatment.

OUTCOME AND FOLLOW-UP

The patient was discharged from hospital 8 weeks post admission. Repeat nasendoscopy 5 months post discharge demonstrated a congenitally abnormal, twisted, infantile epiglottis, with congenital paralysis of the right vocal cord. The supraglottic inflammation had completely resolved.

Figure 3 Image obtained on microlaryngoscopy demonstrating a grossly abnormal larynx, with an oedematous and nodular appearance in the supraglottic and vocal cord regions.

He is receiving ongoing treatment from the infectious diseases team and ENT teams and has been successfully decannulated.

DISCUSSION

Laryngeal TB is rare, with most cases being secondary to pulmonary TB.² This case demonstrates a rare pathology and a rare consequence, that is to obstruct the airway to such an extent that emergency intubation must be undertaken. The patient was intubated with no difficulty 1 year prior to his acute presentation; therefore, we conclude that his acute airway obstruction was due to the supraglottic and subglottic inflammation, secondary to laryngeal TB, and not due to a congenital subglottic stenosis. There is very little literature documenting cases similar to the one presented here, and the few case reports that have been published describe tracheostomy placement in non-life-threatening situations.

Difficult intubation was predicted from first assessment and it was therefore decided that early involvement of the local ENT and intensive care teams would be prudent since the chance of requiring a surgical airway was high. This would enable teams to arrive (from 20 min away), prepare equipment and communicate with theatre staff while the patient was transferred to theatre. The decision to transfer the patient to theatre was taken for a number of reasons, primarily to improve access to the patient and have more room to work than in a cubicle in the emergency department. Specialist airway equipment such as the videolaryngoscope is also available, and the patient is in a sterile

environment if surgical access is required, with theatre staff who are familiar with performing a tracheostomy.

Communication with the full team was imperative due to the complexity of the case. Alternative plans for securing the airway were considered and discussed. An awake fibre-optic intubation was impossible due to the patient's condition, with severe respiratory distress and copious upper airway secretions. The possibility of an inhalational induction of anaesthesia with maintenance of spontaneous breathing was discounted since the patient was not fasted and, in adults, it takes a significant amount of time to reach a depth of anaesthesia that is adequate for instrumentation of the airway; during this period, there is a risk of aspiration of stomach contents and loss of the airway. In addition, the possibility of an awake tracheostomy (under local anaesthesia) was discussed with the ENT team, but this was not possible since the patient was unable to lie flat for the surgery and was already distressed and agitated. He was maintaining a 'tripod' position in order to maintain an open airway and could not tolerate even a semirecumbent position.

Learning points

- ▶ Remember to include tuberculosis in the differential diagnosis for patients presenting with acute upper airway obstruction.
- ▶ Be aware of the environment, and whether it is the most suitable place to perform a procedure.
- ▶ It is important to work as a multidisciplinary team when managing patients with critical airway obstruction. Early communication with specialist teams is essential.
- ▶ It is important to have a clear plan and allocation of roles to team members prior to induction of anaesthesia in a patient with a predicted difficult airway. Guidelines (such as those from the Difficult Airway Society) are helpful for planning airway management in difficult cases.

A full team brief was conducted (consisting of the anaesthetists, ENT surgeon and theatre staff), and tasks were allocated to different personnel, including one team member to 'clock watch' in order to reduce the potential for task fixation. Furthermore, following an algorithm such as the DAS guidelines allowed team collaboration in order to facilitate emergency airway management because everyone works to a common set of instructions (which have often been practised in teaching and simulation settings), and this helps clear decisions to be made quickly. They also allow easier recognition of when one specialty should hand over to another; this was the key to a successful outcome in this case.

Contributors AEC and DH made substantial contributions to the conception and design of the work. AEC acquired relevant details regarding the case, while DH reviewed current literature. AEC drafted the work and revised it as appropriate. Final approval of the version published was checked by DH and AC. Agreement from all authors has been sought in order to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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REFERENCES

- 1 Matsuura H, Yamaji Y. Laryngeal tuberculosis: a forgotten disease. *QJM* 2017;110:521.
- 2 Paulauskienė I, Mickevičienė V. Dysphonia - the single symptom of rifampicin resistant laryngeal tuberculosis. *Open Med* 2016;11:63–7.
- 3 Jindal SK, Jindal A, Agarwal R, *et al.* Upper respiratory tract tuberculosis. *Microbiol Spectr* 2016;4.
- 4 Frerk C, Mitchell VS, McNarry AF, *et al.* Difficult Airway Society 2015 guidelines for management of unanticipated difficult intubation in adults. *Br J Anaesth* 2015;115:827–48.
- 5 Mallampati SR, Gatt SP, Gugino LD, *et al.* A clinical sign to predict difficult tracheal intubation: a prospective study. *Can Anaesth Soc J* 1985;32:429–34.

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