

# Anaesthesia for surgery of the trachea and main bronchi

Alistair Macfie

Philip McCall

## Abstract

Major surgery on the trachea and airway is an anaesthetic challenge, which necessitates the simultaneous control of the airway, maintenance of gas exchange and good surgical exposure. Advance planning, good communication and teamwork among surgeon, anaesthetist and theatre staff are never more important. A major indication for laryngeal and tracheal surgery is laryngotracheal stenosis, a rare condition, which can cause significant morbidity and life-threatening airway obstruction. In the era of modern medicine, post-intubation injury has superseded infection and external trauma as the commonest aetiology. Definitive surgery is usually carried out in tertiary specialist centres, where segmental resection of the trachea with primary end-to-end anastomotic reconstruction is usually the technique of choice. Provision of anaesthesia for bronchial sleeve resection and removal of inhaled foreign bodies faces similar challenges.

**Keywords** Airway; anaesthesia; stenosis; surgery; trachea

**Royal College of Anaesthetists CPD matrix:** 2A01; 2A07; 3G00

## Tracheal anatomy

This is described in *Anaesthesia & Intensive Care Medicine* 2011; 12(12): 533–538.

## Laryngotracheal stenosis

The major causes of laryngotracheal stenosis are listed in [Table 1](#). Post-intubation benign stricture is the commonest indication for tracheal resection and is typically a consequence of prolonged tracheal intubation or tracheostomy. When the cuff of the tracheal tube exerts a tracheal wall pressure in excess of the capillary perfusion pressure of the tracheal mucosa then ischaemic injury will result. Prolonged, severe or recurrent tissue injury results in ulceration, chondritis, granulation tissue formation and, over time, concentric fibrotic contraction and airway narrowing. Direct injury from the tracheal tube wall may also result in granuloma formation and arytenoid cartilage damage. Modern high-volume, low-pressure cuffs have lowered the risk of tracheal stricture, however the total number of patients surviving prolonged intubation has increased. Traction on the tube and local infection also contribute to the development of stenoses.

**Alistair Macfie** *FRCA FFICM* is a Consultant in Cardiothoracic Anaesthesia and Intensive Care at the Golden Jubilee National Hospital, Clydebank, Dunbartonshire, UK. Conflicts of interest: none declared.

**Philip McCall** *MBChB* is a Clinical Research Fellow, Academic Unit of Anaesthesia, Pain and Critical Care Medicine, University of Glasgow, UK. Conflicts of interest: none declared.

## Learning objectives

After reading this article, you should be able to:

- describe the aetiology and presentation of laryngotracheal stenosis
- discuss the central role of rigid bronchoscopy in airway assessment
- compare the airway management for upper and lower tracheal resection

Suprastomal stricture is a recognized late complication of both open surgical and percutaneous tracheostomy. Shortness of breath is the most common presenting feature but it may be discovered following problems with routine intubation. A summary of the features of presentation of tracheal stenosis is provided in [Table 2](#).

## Investigation

A previous history of tracheal intubation or tracheostomy should alert the clinician to the possibility of tracheal stenosis, which is often not evident on plain posteroanterior and lateral radiographs. Computed tomography (CT) or magnetic resonance imaging (MRI) scans demonstrate tracheal narrowing but may not accurately determine the exact length and position. Three-dimensional reconstructions of the tracheobronchial anatomy are providing surgeons with additional information to guide surgery.

Spirometric flow volume loops (see article on ‘Tests of pulmonary function before thoracic surgery’ on pages 495–498 of this issue) were historically important in the diagnosis of intrathoracic airway obstruction. They are now generally not

## Aetiology of adult laryngotracheal stenosis

Post-tracheal intubation	Cuff-related circumferential stricture Granuloma, arytenoid injury
Post-tracheostomy	Stomal stenosis
Trauma	Penetrating or blunt external trauma Irradiation and burns
Benign neoplasm	Respiratory papillomatosis Carcinoid tumour
Malignant neoplasm	Primary: adenoid cystic and squamous carcinoma; Secondary: thyroid carcinoma Metastatic
Chronic inflammatory disease	Amyloidosis, Sarcoidosis
Collagen vascular diseases	Relapsing polychondritis Wegener's granulomatosis
Bilateral vocal cord dysfunction	Bilateral recurrent laryngeal nerve injury
Infection	Tuberculosis, diphtheria
Idiopathic	Idiopathic progressive subglottic stenosis

**Table 1**

### Presentation of tracheal stenosis

- Presents weeks to months after intubation
- Slowly progressive dyspnoea
- Cough and wheeze easily mistaken for asthma
- Inspiratory stridor
- Recurrent pneumonias

**Table 2**

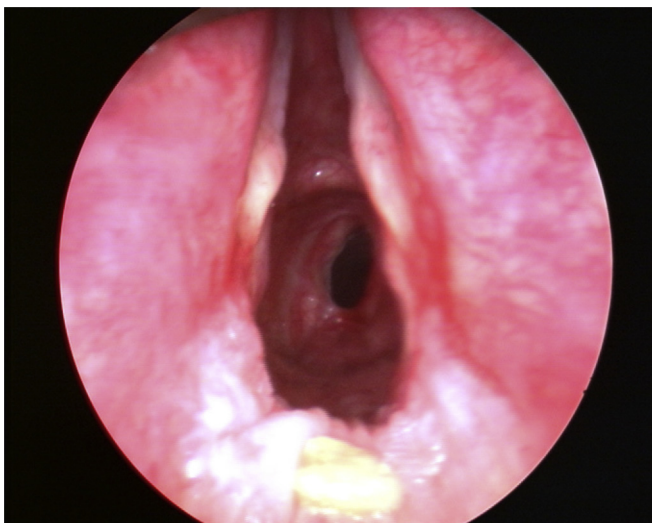
instrumental in making a definitive diagnosis, but may be helpful to monitor the progression of airway obstruction after treatment. They may also help identify if there is fixed or dynamic tracheal obstruction.

Endoscopy is critically important for evaluation of both the larynx and trachea (Figure 1). The larynx may be assessed by indirect mirror examination and flexible nasolaryngeal endoscopy.

Because severe tracheal stenosis may deteriorate into complete obstruction during awake flexible bronchoscopy, tracheal stenosis should be defined by rigid bronchoscopy under general anaesthesia. Passage of a rigid bronchoscope can be life saving in cases of central obstruction or extrinsic compression of the airway following induction of anaesthesia. Rigid bronchoscopy also allows full assessment of the lesion, biopsy, if appropriate, and assessment of the health of the surrounding mucosa.

#### Anaesthesia for bronchoscopy

Either inhalational or intravenous anaesthesia can be used for induction of anaesthesia. Inhalational induction maintains spontaneous ventilation and avoids muscle relaxation until the airway is secured. However, coughing and instrumentation can precipitate complete obstruction in patients with central airway obstruction. In practice, intravenous anaesthesia and muscle relaxation with suxamethonium (succinyl choline) are generally used to rapidly provide surgical anaesthesia to facilitate the passage of a rigid bronchoscope. Administration of short-acting intravenous agents such as propofol and remifentanyl ensures a



**Figure 1** Subglottic tracheal stenosis.

rapid and complete recovery of consciousness. Atmospheric pollution from escape of volatile gases from the open airway during anaesthesia is also avoided. Ventilation is provided through the bronchoscope with a Venturi-type injector. The rigid bronchoscope thereafter ensures a clear airway and ventilation with oxygen-enriched air.

#### Acute treatment of tracheal stenosis

Emergency treatment of severe respiratory difficulty is initially with steroids, nebulized racemic adrenaline, and diuretics, which temporarily improve mucosal oedema and airway obstruction. Antibiotics may be required to treat associated bronchopulmonary infection. Passage of a rigid bronchoscope in this situation may be life saving. Often, benign tracheal stenosis will be dilated to relieve stridor and to allow assessment and optimization of the respiratory status before definitive surgery occurs. Dilatation of circumferential lesions usually provides temporary relief only and restenosis occurs. Results of endoscopic resection of granulomas and other non-circumferential lesions are somewhat better.

#### Tracheal and bronchial stenting

Airway stents are inserted to provide symptomatic relief for obstructing nonresectable primary airway tumours. Stents may also be of benefit in the management of central airway obstruction as a result of extrinsic compression from goitres, mediastinal masses, thyroid tumours or lymphomas. Stenting may be used as a bridge to curative or palliative treatment. Self-expandable airway stents can be deployed under fluoroscopic control through an orotracheal tube. Rigid bronchoscopy provides better visualization and more room within the airway, which allows deployment of all types of stents. General anaesthesia is often required for stent insertion as control of airway reflexes and maintenance of a patent airway are essential.

#### Laser therapy

Laser treatment of tracheal strictures has variable results and, as with dilatation, the result is usually a temporary measure prior to definitive treatment. A carbon dioxide laser can be used to palliate unresectable airway tumours that are causing central obstruction. In laser airway surgery, precautions such as ventilating with air should be taken to prevent the risk of fire in an oxygen rich environment. Laryngeal lesions and subglottic lesions may require the use of laser-resistant tubes.

#### Tracheal reconstruction

##### Surgical techniques

Tracheal resection and primary anastomotic reconstruction is the preferred surgical treatment of severe tracheal stenosis. The number of rings resected depends on the pathology and the length of the lesion. Modern surgical techniques have produced good results with resection of up to half the tracheal rings. The surgical approach can be cervical, cervicomedial or posterolateral thoracotomy. A cervical approach to the subglottic and upper trachea is performed through a collar incision. In addition, a partial or full sternotomy may be necessary for access to the intrathoracic portion of the trachea, whereas for good surgical exposure of the lower trachea a right thoracotomy is required. Major complications of the surgery include restenosis,

Download English Version:

<https://daneshyari.com/en/article/2742255>

Download Persian Version:

<https://daneshyari.com/article/2742255>

[Daneshyari.com](https://daneshyari.com)