Nonoperative Endoscopic Management of Benign Tracheobronchial Disorders

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KEYWORDS

• Bronchoscopy • Airway stenting • Tracheal dilation

KEY POINTS

- Advanced bronchoscopy is a fundamental skill required by thoracic surgeons.
- Dilation of the airway is now most simply accomplished by balloon dilation.
- Stenting of the airway for benign lesions requires skill with a variety of techniques and stents.
- A variety of ablation therapies are available for advanced management of airway lesions.

Endoscopy of the airway is a fundamental skill required of thoracic surgeons who manage airway abnormality. The modern videobronchoscope has certainly made airway evaluation easier and allows all in the procedure room or operating room to be engaged in the procedure. Bronchoscopes come in several different sizes (diameters), including neonatal (3.1 mm), pediatric (4.2 mm), regular adult (4.8 mm), and therapeutic (6.2 mm). Therapeutic bronchoscopes with a larger therapeutic channel allow passage of larger biopsy forceps, balloon dilators, and laser and cryotherapy devices. Rigid bronchoscopy was almost a lost art but has been resurrected and is now a mainstay again for endoluminal therapy for the airway.[1,2] Rigid bronchoscopy allows ventilation, the use of large suction catheters for aspiration, removal of foreign bodies, passage of larger therapeutic devices into the airway, and use of the tip of the bronchoscope to debulk obstructing tumor quickly. Rigid bronchoscopes of varying sizes can also be used for serial dilation of tracheal stenoses. Rigid bronchoscopy requires close collaboration with the anesthesiologist and a thoughtful strategy for ventilation, either standard ventilation or jet ventilation. The introduction of a rigid bronchoscope into the airway is often a challenging procedure for novices. Simulators are available as well as videos to help teach this almost-lost art. Of course, general anesthesia is required for rigid bronchoscopy. Proper positioning is important with extension of the head and neck, and sometimes a shoulder roll is helpful to further extend the head. Protection of the teeth with a tooth guard is required. Suctioning of the airway before insertion of the bronchoscope is helpful, of course. The anesthesiologist should make sure the patient is well ventilated and oxygenated before attempting insertion to allow the surgeon a leisurely amount of time to access the airway. Some surgeons use a laryngoscope first to expose the supraglottic area, allowing easy passage of the rigid bronchoscope with a limited field of view into the airway. Others, the author included, prefer to introduce the rigid bronchoscope and use it as a fulcrum to elevate the back of the tongue, expose the supraglottic area, and then introduce the bronchoscope into the airway. This procedure is usually accomplished most easily from the midline of the mouth and is, of course, facilitated if the patient is edentulous. Alternatively, if the

Disclosure: The author has nothing to disclose.
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Thorac Surg Clin 28 (2018) 243–247
https://doi.org/10.1016/j.thorsurg.2018.01.009

patient has somewhat protruding teeth, the surgeon can insert the bronchoscope from the lateral aspect of the mouth, which allows an easier plane of insertion into the airway.

AIRWAY STENOSIS

There are many causes of benign airway stenosis, and most of them are iatrogenic (Box 1). Extrinsic benign stenoses are usually treated by removal of the offending agent causing pressure on the airway. Intrinsic benign stenoses are usually treated by dilation, at least as an initial step in their management. Dilation can be done with gradually increasing sizes of rigid bronchoscopes, with plastic bougies of gradually increasing sizes, or by balloon dilation (Fig. 1). Balloon dilation has the advantage of being able to be performed with the therapeutic flexible bronchoscope and is the most common method of dilation now. The balloon dilators come in assorted sizes for accurate dilation diameters. One disadvantage of balloon dilation is there is no "feel" of the stenosis, so it is possible to overdilate and disrupt the airway if one is not careful. Postintubation tracheal stenosis is the commonest benign stenosis treated by bronchoscopic techniques. If patients are treated acutely, it is important to know as much about the airway as possible before therapeutic intervention. Sometimes a simple posterior-anterior and lateral chest radiograph will clearly show the area of stenosis and its length and the status of the distal trachea beyond the stenosis. More commonly, a computed tomographic (CT) scan is performed that will allow a much more precise estimation of the location, length, and degree of stenosis. Typically a CT will underrepresent the degree of stenosis. The surgeon must make plans to control the airway if the patient is in any distress and must be ready to quickly dilate the airway to allow satisfactory ventilation. Tracheostomy beyond the lesion is rarely necessary because endoscopic techniques usually will rapidly reestablish an airway. Obviously, blind tracheostomy without knowing the status of the distal airway or where it is normal is to be avoided because opening the trachea in an area of stenosis is fraught with trouble and often leads to disaster. Especially close communication with the anesthesiologist is necessary when taking an acutely dyspneic patient with postintubation stenosis to the operating room for urgent airway dilatation. Dilations for circumferential postintubation tracheal stenosis typically are a temporizing measure only and will only last for several weeks (Fig. 2). For shorter stenoses with some preservation of native epithelium, it is often worthwhile to attempt a few dilatations to see if the stenosis will settle down into a comfortably dilated state and allow the patient to avoid a tracheal resection. However, if several dilatations fail to correct the problem and the patient has a short operable stenosis, referral should be made for tracheal resection. Posttracheostomy stomal stenoses typically do not respond to dilatation well but also happily are rarely severely symptomatic (Fig. 3). The pathophysiology of the formation of stenosis is, of course, different from a cuff stenosis, which is circumferential. Stomal stenoses occur because of necrosis and collapse of the anterior wall of the trachea, leading to an A-shaped stenosis. Typically, the lateral and posterior walls are relatively unaffected and have normal mucosa. Stomal stenosis are usually stable stenoses as opposed to circumferential cough stenoses, which often have abnormal epithelium or granulation tissue. Stomal stenoses do not dilate well because the membranous wall is typically quite flexible and stretches as a dilator is passed.

Box 1
Causes of benign central airway obstruction

Intrinsic

Postintubation tracheal stenosis

Posttracheostomy stomal stenosis

Anastomotic stricture

Granulation tissue

Tuberculosis, histoplasmosis, sarcoidosis

Amyloid

Papillomatosis

Tracheopathia osteoplastica

Relapsing polychondritis

Extrinsic

Lymphadenopathy: sarcoidosis, tuberculosis, histoplasmosis

Goiter

LASER THERAPY

Several lasers are useful for benign tracheobronchial disorders.[3] These lasers include the Nd:YAG, KTP, and thulium lasers. All 3 of these provide a good combination of hemostatic as well as cutting/vaporization effect. Lasers are quite helpful in clearing granulation tissue. Lasers are also helpful in conjunction with mechanical removal or to core out airway tumors. They can vaporize smaller tumors or treat the residual base of a tumor after mechanical removal. They are also useful to control bleeding at the base of a tumor. Laser safety