The Use of Bronchoscopy in Bronchiectasis*

FLETCHER D. WOODWARD, M.D., F.A.C.S.† and
M. LAWRENCE WHITE, JR., M.D.¶
Charlottesville, Virginia

Bronchiectasis is a serious, progressive, and widespread disease, which carries a high morbidity and mortality, and should be recognized as such. Its management depends on a sound knowledge of disease of the entire respiratory tract, and involves medical, bronchoscopic, and surgical treatment.

Bronchoscopy is a necessary adjunct in diagnosis and treatment, and although it now is occupying a diminishing role with the advances of iodized oil bronchography, chemo- and antibiotic therapy, and surgery, it still has much to offer. This is particularly true in the field of prevention, for by its use in the treatment of known predisposing causes, many cases of bronchiectasis are prevented. The increasing success of thoracic surgery in the treatment of intrathoracic diseases has no better example than the cures now possible in victims of bronchiectasis, and bronchoscopy has contributed no small part to this success.

Neither bronchoscopic nor routine roentgenographic examination will establish a diagnosis of bronchiectasis. But the information obtained from them in addition to the information obtained from iodized oil bronchograms will establish an exact diagnosis.

The appearance of the mucous membranes, as viewed endoscopically, varies widely. In most cases there is a red, swollen membrane, particularly in the bronchi serving the involved broncho-pulmonary segments; or there may be a marked acute bronchitis if the examination is done at the time of an exacerbation, so common in these patients. The membrane frequently bleeds easily, but rarely profusely, under instrumental manipulation. At times the orifices to the secondary bronchial divisions may be found occluded by an edematous membrane or by actual granulation tissue.

The amount and character of the bronchial secretions encountered during bronchoscopy may be influenced by the severity of coughing induced by the induction of topical anesthesia to the pharynx and larynx; and since the preservation of an active,

*Presented at the 33rd Clinical Congress of the American College of Surgeons, as a part of a symposium on Bronchiectasis, New York, N. Y., September 9, 1947.
†From The Department of Otolaryngology and,
‡The Department of Surgery and Gynecology, University of Virginia, School of Medicine and Hospital, Charlottesville, Virginia.
productive cough is desirable, both for diagnostic and therapeutic reasons, tracheal and endobronchial anesthesia is not advised. Candidates for bronchoscopy will frequently expectorate such large quantities of heavy purulent material while the pharynx and larynx are being anesthetized that only small amounts will be found within the bronchial tree on examination. However, in most cases the lobar distribution of the disease can be determined by observing the individual bronchial orifices during forced coughing. This fact is extremely important in deciding which side harbors the more active infection in bilateral cases, apparently suitable for operation. Quite frequently we have encountered cases in which the bronchograms showed equal distribution of disease in each lower lobe, but on bronchoscopy the secretions were found to arise almost wholly from one side. Obviously such information is of paramount importance in selecting the proper side for initial resection. One such case is illustrated (Fig. 1).

There is one bit of information derived from bronchoscopy that has never been fully emphasized heretofore in the literature. This is the odor emitted through the bronchoscope. A large percentage of our bronchiectatic patients will not complain of any odor to their sputum or breath, and no physical examination no odor will be detected. Even a direct sniff of the sputum cup may not reveal an unpleasant odor, but with the bronchoscope in the involved lung, an unmistakable, foul odor is noticed, which signifies a necrotizing infection and is therefore of considerable diagnostic and prognostic value.

The value of inspection and biopsy of the bronchial mucosa is too often overlooked in obvious cases of bronchiectasis. The diagnosis seems so certain in many cases that one is tempted to omit a direct examination, which may disclose an unsuspected foreign body, neoplasm, or other obstruction. It is our belief that all patients with this disease should be bronchoscoped, if for no other reason than more accurately to establish a complete diagnosis. Two cases of bronchiectasis, one of unsuspected foreign body origin and one associated with carcinoma, are illustrated in Figures 2 and 3. Both of these diagnoses would have been missed had bronchoscopy been omitted.

Of particular importance in cases selected for surgical resection is bronchial anatomy. Information derived from bronchography is not complete and direct inspection is necessary. The relationship of the upper lobe orifice to the trachea and the relationship of the right middle lobe orifice to the dorsal bronchus of the lower lobe are two important aspects of surgical anatomy made by bronchoscopic inspection.

Since we feel that bronchiectasis is a disease which results from
FIGURE 1
A 36-year-old white female with advanced bronchial disease of the right middle and lower lobes and the left upper and lower lobes had the left lower lobe resected. Congestive heart failure and severe bronchiectasis were present.

FIGURE 2
A 40-year-old white female with marked relief of symptoms. Resection of the right upper lobe was performed.

FIGURE 3
A 48-year-old white female with marked relief of symptoms. Resection of the right upper lobe was performed.

The patient was a 50-year-old white male with marked relief of symptoms. Resection of the right upper lobe was performed.

FIGURE 4
A 52-year-old white male with marked relief of symptoms. Resection of the right upper lobe was performed.

FIGURE 5
A 56-year-old white male with marked relief of symptoms. Resection of the right upper lobe was performed.

FIGURE 6
A 60-year-old white male with marked relief of symptoms. Resection of the right upper lobe was performed.
bronchial stenosis and infection, the bronchoscope is necessary in order to rule out or relieve bronchial stenosis, whatever its cause may be. Among these causes are: retained secretions as seen in the new-born or following general anesthesia; or inflammatory processes in the lung and bronchi; or foreign bodies, tumors, granulomas, and strictures; or compression stenoses from extrabronchial causes. Of course, in the majority of cases coming to bronchoscopy, the bronchial stenosis no longer exists.

The bronchoscope is also valuable in obtaining secretions for direct smears and cultures uncontaminated by pharyngeal and mouth bacteria. These specimens should be studied both aerobically and anaerobically for bacterial types and fungi. We have found tubercle bacilli on smears in patients in whom a diagnosis of tuberculosis could not be made otherwise. The cultures are useful for the preparation of autogenous vaccines and for determining bacterial type and resistance behavior, so that the most suitable drug may be employed. It seems logical to us that the necrotizing toxin of certain strains of staphylococci must play an important role in the production of this disease.

Finally, the bronchoscope may be useful in determining the lobar source of hemorrhage, and for making iodized oil bronchograms in certain areas which could not be filled and demonstrated by routine methods.

**Bronchoscopy in Treatment**

In general, bronchoscopic intervention plays an important role in the treatment of bronchiectasis in three types of cases: (1) patients with acute exacerbations of old, usually quiescent bronchiectasis; (2) patients whose disease is anatomically suitable for operation but whose poor general condition precludes operation until the infection has been brought under control and their general condition improved; and (3) patients with a hopeless bronchiectasis, such as those who are too old, or those who have other serious diseases, or those in whom the extent of the involvement contraindicates operation. In these patients bronchoscopy is then employed as a palliative procedure.

The most useful therapeutic purpose of the bronchoscope rests in the ability to aspirate bronchial secretions and to relieve bronchial obstruction. The objective and subjective relief afforded by bronchoscopic aspiration defies adequate explanation in patients who do not have a real bronchial block. It seems unlikely that a patient whose sputum is profuse and is particularly influenced by posture would gain relief for as much as several weeks from such an aspiration, but many case histories will bear out proof of this by the spontaneous return visits of these patients
requesting bronchoscopies. This relief is no doubt brought about by the violent coughing induced by the bronchoscope which causes a much more thorough expulsion of bronchial secretions than would ever be obtained voluntarily. It is easy to understand the relief afforded by release of an acute inflammatory (mucosal edema or granulation tissue) obstruction with a removal of tenacious secretions from the depths of the smaller bronchi. The actual bronchoscopic technique involves the passage of an appropriate aspirating tip, olive-tipped bougies or small bronchoscopic sponges on a carrier. Following such manipulation, the use of expectorants, inhalations, and postural drainage should be employed.

The value of the bronchoscope in permitting the application of drugs to the mucous membrane has been minimized by some and overemphasized by others. Epinephrine and other sympathicomimetic drugs applied to a swollen membrane do have some shrinking effect, although much less so than when applied to the nasal mucosa. This action is obviously advantageous in enlarging the bronchial airway. The shrinking agent can be applied on a bronchoscopic sponge or it can be flushed into the bronchial tree directly through the bronchoscope.

The advent of the chemotherapeutic and antibiotic agents brought a brief flurry of hope that topical application through the bronchoscope would be effective. However, we now feel that our hopes were unfounded, for no demonstrable improvement was obtained, probably because of the brief period of contact of the drug. The action of the ciliated epithelium and the cough associated with bronchoscopy soon rid the bronchi of either powder or solution. The aerosol method of inhalation of antibiotics is more sound and has given better results.

Bronchoscopy is not without hazards. Occasionally a severe pulmonary hemorrhage will occur during bronchoscopy. In this event the examination should be terminated, for in our experience bleeding has ceased spontaneously after the withdrawal of the bronchoscope. Of course, a blood transfusion should be given if necessary. An additional hazard is the occasional case of spontaneous pneumothorax which may occur. Sudden chest pain and dyspnoea should make one suspect this complication.

**Bronchoscopy in Prophylaxis**

A discussion of bronchoscopy in the treatment of bronchiectasis must emphasize the prophylactic treatment. It is a most uncommon pulmonary infection that does not produce some secretion. This secretion is always a potential hazard because if not evacuated promptly, it will occlude the airway. Such occlusion
results in atelectasis, and however transient and however small the bronchus, irreperable damage may occur. It takes a very brief time for the combination of infection and obstruction to destroy bronchial walls, or necrotize pulmonary tissue. Opinion today favors this etiology of bronchiectasis, particularly in children. Therefore, it is urged that all cases with pneumonia, tuberculosis, tracheobronchitis, pulmonary suppuration, or any of the rarer infections be bronchosoped without delay when the clinical course, physical findings, or roentgenographic details point to retained bronchial secretions. The masking effect of the sulfonamides and antibiotics on pulmonary infections is well recognized and should not be overlooked.

Of particular value in the technique of bronchoscopy in such a case is the use of bronchial lavage in the diseased lobe. An adrenalin solution or a solution of normal saline flushed into such a lobe will initiate coughing, which will usually result in the evacuation of secretions not visible through the bronchoscope.

The bronchoscopist can do much in his own hospital by instructing the residents, anesthetists, and nurses on the importance of (1) not depressing the cough reflex by large doses of morphia or codeine; (2) aspiration of the trachea after general anesthesia when indicated, and resorting to the inhalation of a carbon dioxide-oxygen mixture; (3) frequent turning of the patient after anesthesia and getting him up as soon as possible; (4) using postural drainage properly; (5) the value of aerosol therapy; (6) being on guard for the masking effect of the sulfonamides and antibiotics; and (7) the employment of bronchoscopy early in persistent atelectasis, particularly when infection is present.

**SUMMARY**

Although bronchoscopy is playing a diminishing role in bronchiectasis, its many uses in diagnosis, treatment, and particularly prophylaxis are so necessary and important that we feel that it should be employed in all cases—as a routine examination—in order to make a more exact diagnosis, as a method of treatment in selected cases, and finally as a most important and valuable prophylactic procedure.

**RESUMEN**

Aunque se está empleando menos la broncoscopia en la bronqulectasia, sus muchos usos en el diagnóstico, el tratamiento y, particularmente, la profilaxia son tan necesarios e importantes que opinamos que se debe emplear en todos los casos—como examen de rutina—a fin de hacer un diagnóstico más exacto, como tratamiento en casos seleccionados y, finalmente, como procedimiento profiláctico importante y valioso.