Planned Care for Patients with Bronchiectasis

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• *Bronchiectasis, for which once only the most elementary palliation could be offered, now often can be cured by operation or well controlled by conservative therapy.*

Since true bronchiectasis implies irreversible anatomic changes, operation offers the only hope of cure, and it should be undertaken whenever it is not contraindicated by extent of involvement, age of the patient or other factors. Surgical results are excellent and mortality is at a minimum.

When operation is prohibited, good results can still be anticipated by conservative measures. Such conservative therapy should combine prolonged use of antimicrobial drugs with adequate drainage of the diseased segments and general supportive measures. Any residual infection can be controlled by moderate use of appropriate antimicrobial agents.

It is emphasized, however, that the control of bronchiectasis requires very careful diagnostic studies and a detailed analysis of the patient's condition, and that the therapy itself must be carefully adjusted in terms of the individual situation.

TWENTY-FIVE YEARS AGO bronchiectasis was regarded as a chronic disease largely beyond the reach of medical care. The patient could be palliated by postural drainage and by the general hygienic regimens used in tuberculosis, and the bad breath and fetid sputum characteristic of the disease could be ameliorated by creosote. But with or without medical treatment the patient could usually be expected to die within ten years after diagnosis. In a few instances, advanced cases of bronchiectasis were approached surgically by such desperate procedures as thoracoplasty and cautery pneumonectomy, with occasional improvement as a result.

This generally hopeless prognosis of a few short years ago has of course been almost completely reversed. At present, complete cure is often possible by means of surgical extirpation, and in almost every other case the disease can be controlled indefinitely by modern medical therapeutic techniques. This is not to say that the management of bronchiectasis is simple. Underlying the infectious process of true bronchiectasis are irreversible pathological changes in lung structure; and these changes complicate therapy. Each case is an individual problem, and the medical approach to it must be planned in detail if treatment is to be successful. To borrow a military metaphor, bronchiectasis cannot be controlled by a single battle, but only by a carefully planned and conscientiously followed campaign.

DIAGNOSTIC CONSIDERATIONS

The clinical symptoms of bronchiectasis have been accurately described for many years, but since they are the same as those of any other chronic bronchopulmonary suppuration, it is necessary to accurately establish the diagnosis of bronchiectasis and to delineate the extent of the disease. Unless the lesions are so grossly visible on ordinary x-ray films of the chest as to make it superfluous, bronchography is an indispensable procedure. Ideally, both lungs should be entirely mapped with iodized oil even though several roentgenographic studies are required. This is essential for the evaluation of the patient for surgical treatment and is valuable in planning adequate postural drainage. Contraindications to such studies include sensitivity to iodized oil or to local anesthetics.

In a significant number of cases bronchiectasis is secondary to demonstrable bronchial obstruction or stenosis. X-ray films can suggest this possibility, but they are not a substitute for direct bronchoscopic visualization of the bronchial tree. Tumors, foreign bodies or bronchial stenosis secondary to inflammatory changes may be recognized and appropriately treated. Bronchoscopic examination should always be considered in the evaluation of a case of bronchiectasis. In addition to its direct aid to diagnosis this procedure can be very helpful in clearing major bronchi of inspissated mucous plugs and other debris. Cytologic studies for malignant cells should be done routinely.

GENERAL MEASURES

When a diagnosis of bronchiectasis has been made, treatment should begin with hospitalization if this is at all possible. In part, hospitalization is

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desirable in order to facilitate the control of all the secondary factors which may contribute to the primary disease process. Proper rest, adequate nutrition and hygienic conditions can thus be assured. Anemia, if present, (as it often is with bronchiectasis), can be treated intensively. Also, psychological depression which frequently accompanies bronchiectasis can be dispelled.

Furthermore, hospitalization permits the full investigation and treatment of associated diseases. Chronic upper respiratory tract infections, particularly sinusitis, which continually "feed" the damaged lung segments, must be controlled before control of bronchiectasis is possible. Allergic reactions that bring about bronchospasm and mucosal edema, and thus interfere with drainage, must be controlled. Underlying nutritional disturbances such as occur in mucoviscidosis (pancreatic fibrosis) must be diagnosed and treated appropriately.

SURGICAL TREATMENT

Bronchiectasis is perhaps unique among infectious diseases in the fact that surgical operation, if possible, is the procedure of choice. It offers the only hope of real cure, and, further, this cure can be effected without serious postoperative disability if reasonable care is used in the selection of patients. The great advantages of operation have become particularly apparent since segmental resection was introduced by Churchill and Belsey in 1939.

Each surgeon will of course apply his own criteria of operability. In general, it can be said that the most critical factor is the amount of tissue involved. Although the hazard of a major operative procedure naturally increases with the age of the patient, operation is not necessarily precluded by an age of 50 or even 60 years. Neither is it precluded by bilateral disease, if the total area involved is not too great. The most important contraindications are (1) irreversible bronchospastic states resulting from allergic reaction or chronic infection or (2) fibrosis and emphysema, which are in themselves disabling.

To no small degree, the desirability of surgical treatment of bronchiectasis is due to the remarkable achievements that have been made in this field of thoracic surgery in the past 15 years. At present, hospital mortality ordinarily does not exceed three per cent, even when cases of bilateral disease are included in the computation. In addition, about 75 per cent of the patients who are operated upon are completely cured and another 15 per cent have only mild residual symptoms. Only about 10 per cent of the operations are classified as failures.[4, 6]

There is little doubt that even this impressive record can be improved upon by rigorous preoperative studies. A large portion of the failures heretofore recorded have been classified as due to "incomplete operation." This can be avoided in almost every instance if both lungs are completely mapped with iodized oil. It should be recognized that bronchograms are not without their limitations. Failures of the kind attributed to a preexisting bronchospastic state or to irreversible fibrosis and emphysema can also be minimized by thorough diagnostic studies, although admittedly these conditions are more difficult to evaluate. Surgical complications, another cause of failure, are of course already incalculably reduced by intensive preoperative medical therapy, as well as by continued improvement in surgical technique and anesthesia. The development of new areas of bronchiectasis in the distorted residual segments is a fourth possible cause of failure.

A case report illustrates the typical surgical situation:

A 32-year-old white housewife who was first observed in January of 1945 said that she had had recurrent chest colds since 1941 and in the summer of 1943 had had "virus pneumonia." Since that time she had raised a teaspoonful of "vile-tasting" yellow sputum a day; and there had been several episodes of hemoptysis shortly after recovery from pneumonia. The patient complained of chronic fatigue.

Upon examination the right middle lobe appeared to be the source of the sputum, and postural drainage and treatment with penicillin were instituted, with some relief of symptoms. Pregnancy delayed further evaluation, but the patient returned in October of 1945. At that time bronchography revealed cylindrical bronchiectasis in the right middle lobe (Figure 1). The patient refused to undertake intensive therapy of any sort at that time, but about a year later she finally consented to resection, and the right middle lobe was removed. Thereafter there were no complaints referable to the chest, except for an occasional cold.

It does no disservice to medical terminology to label the foregoing case a cure. Although this kind of operation is still too new to permit certainty in the matter, there is no physiological reason apparent for supposing that this patient is not essentially "normal," with the general life expectancy of her age group.

CONSERVATIVE TREATMENT

It must be reiterated that only operation offers hope of cure in bronchiectasis; the anatomic and physiologic abnormalities characteristic of the disease are not amenable to conservative therapy. On the other hand, a well-balanced and judicious program of conservative therapy can control the disease in almost every instance, and it can restore the patient to normal life within reasonable limits. However, this possibility can only be realized by intensive and prolonged treatment.

The first step in conservative therapy is to effect maximum drainage of the infected area. In many

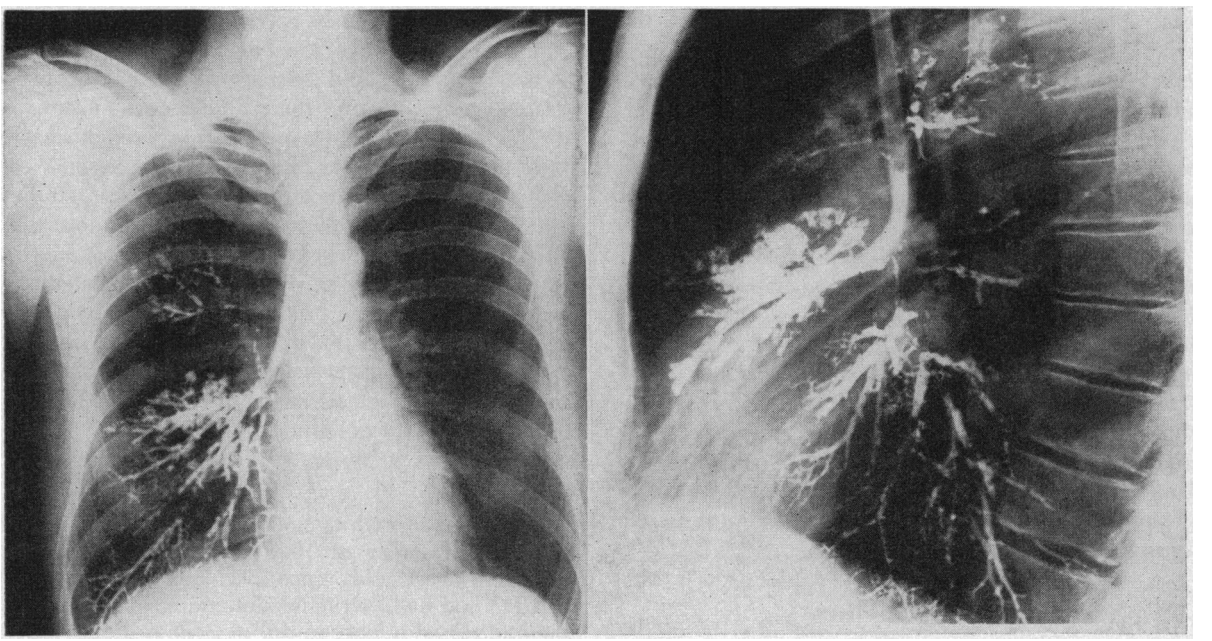

Figure 1.—Cylindrical bronchiectasis in the right middle lobe.

instances the contribution that bronchoscopy can make to this end is very important, since it permits aspiration of the inspissated mucous plugs and other debris difficult to approach in any other way. Local bronchoscopic instillation of antibacterial agents may be accomplished at the same time. Postural drainage, however, remains the most important technique available for the removal of bronchial secretions. It should be done routinely several times a day and should be continued even after the infection has begun to respond to antibacterial therapy. The facilitation of expectoration by various pharmacologic preparations has long been practiced, but the availability of mucolytic enzymes[7] and detergents has added a whole new dimension to this kind of therapy. The enzymes, highly purified trypsin (Tryptar®) and Streptokinase-Streptodornase,® must be used with caution.[3] At times they produce a frothy sputum so thin that it is difficult to expectorate; they may also induce a considerable degree of bronchospasm. A detergent, Alevaire® (Triton WR 1339, 0.125 per cent in combination with 2 per cent sodium bicarbonate and 5 per cent glycerin) has been found to assist liquefaction of sputum in many cases without harmful side-effects. This substance has the additional advantage of being chemically inert, so that it may be used as a vehicle for antibiotics, bronchodilators and vasoconstrictors. It may be administered by a nebulizing technique.

In many, if not in most, cases of bronchiectasis there is some degree of bronchospasm as well as mucosal edema, both of which impede the drainage of secretions. Phenylephrine (Neo-synephrine®) is a decongestant of value. Bronchospasm generally responds well to either racemic epinephrine solution (Vaponefrin®) or to isopropylarterenol hydrochloride (Isuprel®). In the authors' experience these drugs have been most effective when administered by means of a Vaponefrin nebulizer connected to an oxygen tank through a "Y" tube, or in a Bennett Intermittent Positive Pressure Therapy Unit. They should be administered just before postural drainage. If the effect of these bronchodilators is unsatisfactory or they are not tolerated, aminophylline may be found to be of value in the condition.

In most cases, a combination of the above-described techniques is sufficient to assure the first objective of therapy, an adequately drained bronchial tree. When it is obvious that these measures do not permit drainage, the problem is generally tussic insufficiency, owing to deficient aeration in the bronchiectatic segments. This condition is most likely to occur in chronic cases of long standing. Therapy must be directed to the increased ventilation of such segments. Perhaps the two devices designed by Barach, the exsufflator and the artificial cough chamber, accomplish this most effectively; but both devices require modified respirators or lung-immobilizing chambers, which are not yet generally available.[1, 2] The authors have obtained excellent results with the Bennett Unit, which provides intermittent positive inspiratory pressure with a rapid fall to atmospheric levels upon expiration. The Bennett Unit not only helps in the ventilation of diseased lung segments, it permits the simultaneous nebulization of bronchodilators, antibiotics and other drugs.[5]

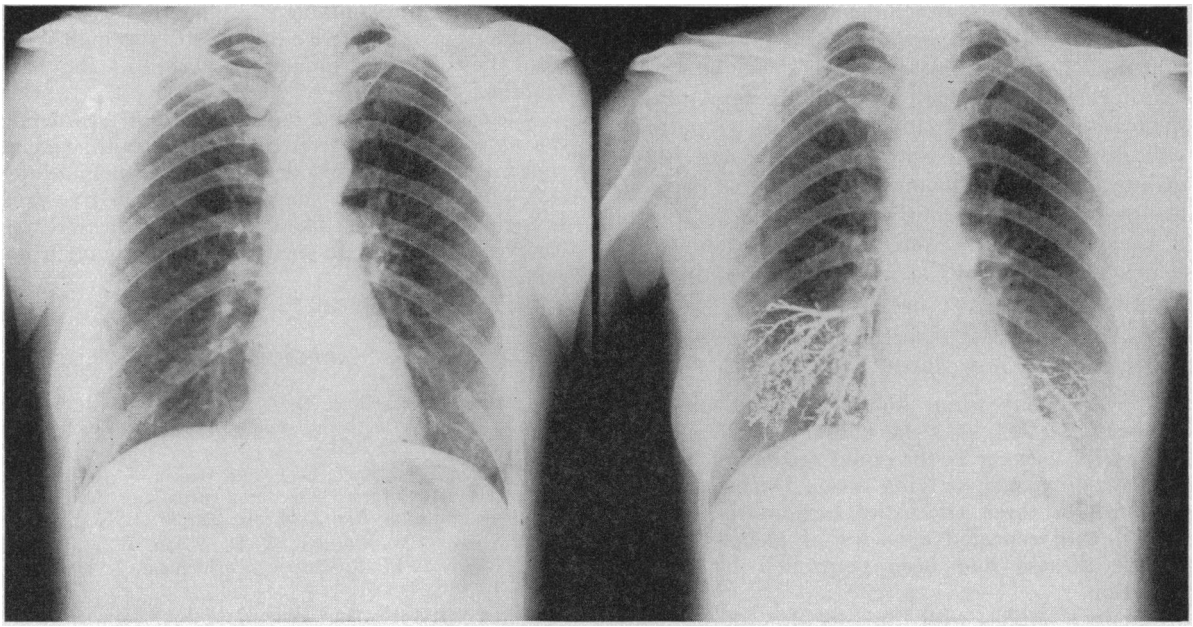

Figure 2.—Roentgenograms with contrast medium, showing extensive bronchiectasis in left lower lobe.

The basis for modern conservative treatment of bronchiectasis is intensive and prolonged use of antimicrobial agents. Success depends in great measure upon two principles—careful selection of drugs, and persistence in maintaining therapeutic levels of the selected drugs. Because of warning as to toxicity and the dangers of resistance and sensitization, there has been a good deal of reluctance to use these drugs over prolonged periods. The authors' experience, however, has indicated that over-extended use is preferable to incomplete therapy. Sensitization and the development of resistant strains has not been particularly troublesome and side-effects have been minimal; and it is believed that resistant organisms are usually the product of incomplete and haphazard treatment rather than of undue prolongation of therapy.

Before therapy is started, sensitivity studies should be done upon the organisms cultured from the sputum, because of the ever-increasing incidence of resistant organisms. Penicillin and streptomycin are usually the drugs of choice if they are effective against the organisms in the sputum, for they do not predispose to monilial infection. Penicillin and streptomycin are usually continued for one to three months. Erythromycin may also prove to be valuable because of its antibacterial range. In smaller doses it may be maintained for up to a year. In general, it is very important that antibiotics be prescribed that will be effective against the entire range of microorganisms present in the sputum. Repeated cultures should be made during the course of therapy to detect the appearance of resistant strains or of organisms not affected by the antibiotics used as indicated by the clinical course.

It should be pointed out that the content of antibiotics in the sputum is at least as important as the content in the blood. Since the flow of blood through bronchiectatic lung segments is often greatly impaired, blood levels that otherwise would be adequate cannot be assumed to guarantee effective therapy. For this reason, the inhalation of nebulized mists of antibiotics, or of micronized dusts, can contribute considerably to therapy. The sulfonamides and penicillin, streptomycin and terramycin have been most commonly used in these ways.

Intensive antimicrobial therapy should be continued for at least two weeks after all grossly purulent elements have disappeared from the sputum. Then dosage should be gradually reduced, and, if no recrudescence occurs, intensive therapy should be discontinued. Further antimicrobial therapy with preparations such as sulfonamides or erythromycin for oral administration should be administered for a period of many months, until it becomes clear that all residual infection has been eliminated. This is, of course, ambulatory therapy, during which the patient may pursue normal activities.

Bronchiectatic patients remain especially liable to acute respiratory infections, but these may be easily controlled by brief courses of intensive therapy. Otherwise they should be restored to full activity within the limits set by the amount of functioning lung tissue remaining.

At times bronchiectasis of long standing will not clear completely under this procedure. Excellent success in controlling such cases, however, has been obtained by continuing medication in reduced dosage on a semi-permanent basis. The sulfonamides are excellent for this purpose, since they can be

taken orally and the development of resistance has not been a serious problem. By this means the patient may be kept free of bronchial symptoms indefinitely and restored to excellent general health. Medication in some patients can be temporarily withdrawn during the summer months and begun again each fall. Chemoprophylaxis has a place in dealing with bronchiectasis comparable to its use in rheumatic fever. Small doses of sulfonamides (1 to 2 grams per day) are useful in preventing new infection with sensitive bacteria.

The following case report illustrates the conservative therapeutic procedures:

A 51-year-old white housewife, first observed October 31, 1949, said she had raised thick green sputum for as long as she could remember, usually upon bending over or lying down. During the previous winter three attacks of hemoptysis had occurred, with repeated episodes of pleurisy. Nasal allergic disease had been controlled by dietary limitation.

Roentgen studies with Lipiodol showed extensive bronchiectasis in the left lower lobe (Figure 2). Conservative therapy was insisted upon by the patient and she was admitted to the hospital in November. Besides postural drainage, a course of combined penicillin and streptomycin therapy was instituted, both intramuscularly and by nebulizer. At the end of two months, sputum had become mucoid and there was pronounced improvement in subjective symptoms. The patient was discharged from the hospital and put on a regimen of 1.5 gm. of triple sulfonamides twice daily. This was maintained until the following summer—a period of about five months.

When last observed more than four years later the patient was in excellent general health, and except for occasional episodes of acute bronchial infection once or twice a year she had been free from bronchial symptoms. The episodes of infection were easily controlled with penicillin, erythromycin and other antibiotics.

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