BRONCHIECTASIS.

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The widespread use of bronchography, i.e. radiography of the chest after injection of lipiodol into the bronchial tree, in recent years has shown that some degree of bronchiectasis is a much more common condition than was previously appreciated. When I say this I am not referring to the advanced stages of this disease, to what may be called the typical text book variety of case, with offensive breath associated with a large quantity of foul-smelling sputum which is expectorated periodically in paroxysms of coughing, especially in the morning, clubbing of the fingers, evidence of toxic absorption and often the physical signs of cavitation of the lung. These cases are relatively uncommon and generally easy of recognition. Slighter degrees of bronchial dilatation are more common and are often responsible for symptoms that are frequently ascribed to other causes, particularly to tuberculosis. The recognition of this type of disease is important not only that we may avoid an incorrect diagnosis of tuberculosis, with its resultant hardship to the patient but because if it is detected early much can be done to prevent it progressing into a more advanced stage.

Cases of bronchiectasis may be grouped into several classes, firstly on anatomical grounds, and secondly according to the severity of the symptoms. The determination of what particular treatment is suitable for any one case should be arrived at by a consideration of both these factors.

According to the severity of the symptoms we may recognise:

Cases of silent bronchiectasis.

Those with slight or moderate symptoms.

Those with severe symptoms.

On anatomical grounds they may be divided for the purpose of treatment into:

- (1) Bilateral cases.
- (2) Unilateral cases, but with more than one lobe involved.
- (3) Unilobar without collapse.
- (4) Unilobar in collapsed lower lobes.

To which of these anatomical groups any particular case belongs can be determined with accuracy only by a bronchogram.

Cases Grouped according to the Severity of Symptoms.

Silent or dry bronchiectasis. This is a term which has been used to designate a group of cases in which there is definite radiographic evidence of bronchial dilatation but in which the symptoms are very few and the physical signs are often very indefinite. Only those cases in which the cough is dry and unassociated with any sputum should be included in this group. They are often detected in the routine investigation of patients who have had an hæmoptysis. It is for this reason that the spitting of blood has come to be regarded by some as an essential feature of dry bronchiectasis.

It is often only after the occurrence of a dramatic symptom, such as a hæmorrhage, that the patient who has a persistent dry cough considers himself sufficiently ill to consult a physician or that the physician deems the case worthy of complete investigation including a bronchogram. If more cases of persistent dry cough were investigated in this manner I am inclined to think that more cases of bronchiectasis unassociated with hæmoptysis would be detected. It is for this reason that I do not think that blood spitting is an essential symptom of this type of bronchial dilatation. The ætiology of this condition is not clearly understood. In the great majority of cases a previous history of an acute respiratory illness can be elicited and it is probable that some such disorder is the factor which initiates the bronchial dilatation in most of them. Some degree of bronchial dilatation should always be thought of when a cough, with or without sputum, has persisted for a number of years after some acute pulmonary illness especially if a small amount of blood has been coughed up from time to time.

Another point that is by no means clear is whether these "dry" cases are liable to develop into the "wet" variety associated with a large quantity of offensive sputum. It is certain that many are seen in which there is every reason to suppose that the dilatation has been present for a number of years but which are still unassociated with any appreciable quantity of sputum.

The whole question of the prognosis in the types of bronchiectasis associated with slight symptoms is very far from clear and a great deal of further observation is necessary before a final pronouncement can be made. The matter is, of course, one of extreme importance from the point of view of treatment. If all or even a large majority of the mild cases eventually progress to the extensive septic varieties little hesitation need be felt in advising measures that aim at a radical cure even if they are associated with a considerable degree of risk. If on the other hand many of them remain stationary for many years a more cautious attitude towards treatment is indicated. Until we have more definite data as to the prognosis in such cases it is probably wise to apply methods of treatment which are associated with any considerable risk only to those cases in which severe and disabling symptoms are present.

Cases with mild or moderate symptoms. In this group may be placed those cases with a persistent cough and a moderate amount of sputum (2 to 3 oz. a day), which though purulent is not necessarily offensive, especially in the morning, and is possibly blood stained. There is an absence of clubbing of the fingers and of toxic symptoms or of deterioration of the general condition. The physical signs are also slight and most often consist of impairment of percussion note at one base with weak breath sounds and persistent coarse rales. Neither the symptoms nor physical signs are characteristic of bronchial dilatation and the diagnosis is most often made as a result of X-ray examination of the chest in patients complaining of persistent cough and sputum and slight hæmoptysis. The combination of a slight hæmoptysis with the above mentioned physical signs should always suggest the possibility of bronchiectasis, if pulmonary tuberculosis can be excluded.

The ultimate prognosis in these cases, as in the silent type, is not clearly understood. I have myself known many such cases which have appeared to remain stationary, or at most to progress very slowly, for many years.

Cases with severe symptoms. In this group all the classical signs and symptoms of bronchiectasis are present. There are physical signs of fibrosis of

the lung with excavation, clubbing of the fingers, evidence of toxic absorption, and an offensive breath associated with the expectoration of large quantities of foul sputum in paroxysms especially in the morning.

Anatomical Groups.

Of the anatomical groups there are three that require special mention.

(1) Apical bronchiectasis.

That bronchial dilatation may occur as a localised lesion at one or other apex has only been recognised of recent years. There can be little doubt that in the past most of these cases have been diagnosed as tuberculosis. Physical signs of cavitation are more often demonstrable in this type of bronchiectasis than in any other. Previously, the detection of the physical signs of a cavity at an apex lead almost automatically to the diagnosis of tuberculosis. It is, of course, perfectly true that the majority of cavities at this site are in fact tuberculous but it should always be borne in mind that they may on occasion be bronchiectatic.

The most important feature in the differential diagnosis between these two conditions is the *repeated* absence of tubercle bacilli in the sputum. Tubercle bacilli will almost invariably be found in the sputum on repeated search when there is a tuberculous cavity in the lung so that their absence should always make the observer strongly suspicious that an apical cavity is bronchiectatic in origin. A straight X-ray will usually assist in the diagnosis as the radiological appearances are generally sufficiently distinctive to differentiate the two conditions. A bronchogram will put the matter beyond doubt.

(2) Middle lobe bronchiectasis.

Localised bronchiectasis entirely confined to the middle lobe on the right side is by no means uncommon. It is the type of this disease that it is easier to miss than any other. It more often than not gives rise to no abnormal physical signs, the straight radiogram may show very little abnormal beyond slight crowding together of the bronchi in the middle zone close to the heart, which may easily be overlooked unless specially looked for and even the bronchogram, when seen in the antero-posterior view, may be equivocal. It is only the careful observation of a lateral bronchogram that may reveal the presence of a slight degree of bronchial dilatation in the right middle zone. Most of the cases of this type of the disease that I have personally met with have been detected in the routine investigation of cases of slight hæmoptysis unassociated with any other serious symptoms or any abnormal physical signs.

(3) Bronchiectasis in collapsed lower lobes.

In this type the bronchial dilatation is often confined to one lower lobe, more often the left than the right. The physical signs consist of a triangular area of dullness at the base of the lung and close to the spine. The breath sounds over this area are bronchial or cavernous and there are usually rales of a metallic character present. The skiagram of the chest shows a dense triangular opacity the apex of which is situated at the point where the diaphragm meets the spine and the base extends from the hilum of the lung to about the junction of the inner and middle third of the diaphragm. When situated on the left side the collapsed lobe lies behind the heart and, unless a picture with extra penetration is taken, is often obscured by the cardiac shadow. The upper lobe on the affected side appears darker than the corresponding lobe on the opposite side due to compensatory emphysema. The heart is displaced towards the affected side.

PLATE I.

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FIG. 1.—Bronchogram of chest showing apical bronchiectasis. Picture taken in prone position.

FIG. 2.—Same as Fig. 1 but taken in erect position. The skiagram shows numerous fluid levels formed by the oil gravitating to the bottom of the bronchiectasis cavities.

FIG. 3.—Bronchogram of chest showing saccular bronchiectasis in collapsed left lower lobe.

FIG. 4.—Bronchogram of same chest as seen in Fig. 3 after removal of the collapsed left lower lobe.

FIG. 5.—Bronchogram, showing saccular bronchiectasis in collapsed right lower lobe.

The ætiology of this condition is obscure. Three theories have been put forward to explain it. (1) That it is of congenital origin, the bronchial dilatation taking place in an atelectatic lobe which has never expanded; (2) That the collapse has resulted from pressure on the main descending bronchus of enlarged mediastinal glands and (3) That it is a sequel to a lobar pneumonia associated with massive collapse. It is well recognised nowadays that a pneumonia may be associated with a massive collapse of the affected lung which as a rule completely re-expands. On this theory it is assumed that the collapse remains permanently and that bronchial dilatation supervenes.

It is probable that bronchiectasis in collapsed lower lobes has not a single ætiology, but that each of the above factors operates in a percentage of the cases.

Treatment.

Dry bronchiectasis. As long as the patient remains sputum free very little in the way of treatment is called for. The only symptom that is likely to be troublesome is an irritating cough for which a suitable linctus should be given. Occasionally hæmorrhage may be so severe and prolonged as to endanger life. In this event some radical measure of cure such as lobectomy will have to be considered.

Treatment of cases with sputum. The indications for treatment in these cases are:

- (1) To keep the bronchiectatic cavities as well drained and as free from stagnant, purulent material as possible, thereby diminishing the toxic absorption.
- (2) To employ any means available to bring about the obliteration of the cavities.
- (3) To bring about a radical cure by removal of that portion of the lung which contains the diseased bronchi.
- (4) To relieve the individual symptoms.

Postural drainage. The most effective means of keeping the dilated bronchi free of stagnant material is by postural drainage. In order to decide upon the posture that will most effectively drain the cavities in each case careful localisation of the lesion must be made. The position of the lesion can be inferred, up to a point, from the physical signs but determined much more accurately by bronchograms taken both in the antero-posterior and lateral positions. From a radiological point of view the chest is divided into the upper, middle, and lower zones. The posture to be adopted for drainage when the lesion is in each of these zones will be described briefly.

(a) *Upper zone.* Seeing that the upright position is the best position for drainage of apical bronchiectasis, this type of lesion is not as a rule associated with stagnation of secretion in the cavities and the expectoration in paroxysms of foul sputum. The only precaution that it is necessary to take is to ensure that the patient sleeps well propped up with an adequate supply of pillows so that no stagnation takes place at night.

(b) *Middle zone.* According to the position in the lateral picture, lesions in the middle zone may be divided into those situated mesially, posteriorly or anteriorly. The posture for the lesions situated anteriorly is flat on the back. For

those situated mesially the posture is flat on the side with the diseased side uppermost. In the case of lesions situated posteriorly the position is lying flat on the face.

(c) *Lower zone.* Lesions in this zone may likewise be situated in the front, the middle or the posterior part of the chest. For lesions in the lower zone a postural drainage bed has been devised by Nelson. The mattress frame of this bed is hinged across the middle and on winding a handle at the foot of the bed the centre gradually rises. Before winding up, the patient lies with the anterior iliac spine opposite the hinge. After the bed is wound up the head, thorax and abdomen hang down on one side and are counterbalanced by the lower limbs on the other.

It is usually necessary to educate the patient gradually to lying for any length of time in the inverted position. It is my custom in cases of basal bronchiectasis associated with any considerable amount of sputum and requiring postural drainage on a Nelson bed, to take the patient into a hospital or other institution in the first instance. They are there placed on a drainage bed for 15 minutes morning and evening to begin with. The period of inversion is increased daily, the rate of the increase varying with the endurance of the patient, until they are being tipped up for two hours morning and evening. Many patients can be trained to sleep in the inverted position, in which case the bed should be kept "wound up" all night as it is particularly at night that the bronchial secretions are apt to accumulate in the dilated bronchi. After a period of thorough drainage in an institution the patient can be sent home to continue the treatment there. They should be given a simple apparatus made of ply wood which can be placed on a spare bed and covered with a mattress, which will serve as a perfectly satisfactory substitute for a Nelson bed. They should lie on this in the appropriate position for an hour morning and evening. In most cases this "tipping" should be continued indefinitely.

Bronchoscopic lavage. By means of a bronchoscope—passed down the trachea and into one or other of the main bronchi a certain amount of pus may be aspirated by suction and the bronchi in the diseased area lavaged. This method of drainage is an operation requiring skilled performance and is unpleasant for the patient. Moreover it is not, in my experience, as effective as postural drainage.

Creosote vapour baths have proved to be a most effectual means of preventing decomposition of the bronchial secretions in bronchiectasis. Whereas postural drainage is the method of election in the more localised lesions, especially when basal, it is mainly in the more generalised types associated with profuse and offensive sputum that relief is felt from creosote vapour baths. A special air tight room is essential, hence the treatment is usually only feasible in an institution. The creosote is vaporised in a flat metal dish placed in a tripod over a spirit lamp. The patient sits on a chair some distance from the tripod, his clothes being protected by an overall and the eyes by goggles. The baths are given two to three times weekly, starting with ten minutes exposure and increasing up to half an hour. Here again the treatment is purely palliative and the condition is liable to relapse when it is discontinued.

Radical cure. The only method of treatment that gives a cure in bronchiectasis is surgical removal of the diseased portion of the lung. A great deal of work has been done of recent years, therefore, in an attempt to perfect the operation of lobectomy. This form of treatment is clearly only applicable to cases in which the disease is strictly localised. The best results are obtained when the disease is confined to one lobe, especially in the lower lobe collapse type. Pneumectomy

(removal of a whole lung) is being performed on an increasing scale in cases in which the bronchi in the whole of one lung are affected but the risks of this operation are proportionally greater.

The mortality from the operation of lobectomy has been reduced to a remarkable extent since its inception but it is still associated with a considerable immediate risk to life. Very great care must therefore be taken in the selection of suitable patients.

In my opinion the **indications for lobectomy** in bronchiectasis are:

(1) *Localisation of the disease.* As mentioned above the disease must be confined to one lobe of the lung for lobectomy to be advised. Precautions must therefore be taken to ascertain that there is no bronchial dilatation in parts of the lung other than the lobe which is obviously affected. Great care in the performance of the bronchogram must often be taken to ensure this. If only a little oil be injected in cases of basal bronchiectasis, especially those with lobar collapse, with the patient in the semi-prone position, it will gravitate to the most dependent and obviously affected part, the bronchi in the adjacent part failing to fill. As many bronchi on the affected side as possible must be filled by using an adequate amount of lipiodol and by suitable changes in the position of the patient. The bronchi on the opposite side must be investigated with equal thoroughness. It is not uncommon, by this procedure, to discover slight bronchial dilatation on the contralateral side in areas not previously suspected. There is yet another consideration which may justifiably cause considerable thought to be taken before recommending an operation of the severity of lobectomy. I have seen cases in which, after a lower lobe lobectomy, dilatation has taken place in the bronchi of the upper lobe though prior to the operation they appeared to be healthy. The frequency of this occurrence will clearly have a considerable bearing on the advisability of the operation.

(2) *The severity of the symptoms.* The symptoms must be sufficiently severe to cause considerable inconvenience to the patient. The symptoms of unilobar bronchiectasis may vary from very little to a more or less persistent cough with a large amount of foul sputum. As has already been mentioned we do not yet fully understand the ultimate prognosis in the cases with no or slight symptoms. It certainly is not clear that in all of them or even in a majority the bronchial cavities become infected and fetid with purulent and offensive secretions. I myself have followed up some cases which have remained apparently stationary for ten or fifteen years and in which recent bronchograms have shown no obvious change in the bronchiectatic condition. It is not, I think, justifiable to recommend an operation of the severity of lobectomy in the stages of the disease in which the symptoms are slight or absent. It should only be advised when they are sufficiently severe to cause much inconvenience and hardship to the patient.

(3) *Evidence of toxæmia.* Evidence that toxic absorption from the foul and stagnant secretions in the dilated bronchi is undermining the patient's general health is a further indication for lobectomy.

(4) *Hæmorrhage.* Repeated hæmoptyses of sufficient severity to endanger the patient's life are not uncommon in bronchiectasis, and are an indication for the operation of lobectomy even in the absence of other severe symptoms or constitutional disturbance, provided the case is anatomically suitable.

(5) *Age.* The age of the patient is an important consideration in deciding upon the advisability of lobectomy. In general terms the younger the patient, other things being equal, the greater the indication for the operation.

Other Methods employed to Obliterate the Cavities.

Certain other methods designed to obliterate the bronchiectatic cavities have been employed from time to time which, for the sake of completeness, will be mentioned, though none of them can be recommended.

Artificial pneumothorax. Theoretically it might appear that the ideal method of obliterating bronchiectatic cavities would be to collapse the lung. In practice it has proved disappointing. The reason for this is not far to seek. In the first place it is usually impossible to collapse bronchiectatic lungs because they are adherent to the chest wall. Secondly patients with bronchiectasis generally stand collapse of one lung very badly owing to the associated generalised bronchitis and emphysema. Lastly collapse of the lung, even if it is good collapse, does not produce collapse of the bronchiectatic cavities. The lung simply collapses down on to the walls of the cavities which remain patent. For the above reasons artificial pneumothorax therapy in bronchiectasis is contraindicated.

Phrenic avulsion has been employed as a treatment for basal bronchiectasis. The immediate effect of the operation is often a diminution in the amount of sputum. This is probably due to the diminished expulsive power of the cough following paralysis of the diaphragm. The diminution in the amount of sputum is due merely to its retention and not to lessening of the bronchial secretion or obliteration of the bronchiectatic cavities. For this reason the operation is harmful rather than beneficial.

Thoracoplasty. Attempts to obliterate bronchiectatic cavities by means of collapsing the chest wall by extensive rib resection have been widely carried out. The results have been disappointing. For the lower lobe collapse type it is definitely unsatisfactory. Deeply seated cavities at the base of the lung cannot be obliterated by any plastic operation on the chest wall. It is also clearly unsuitable in bilateral disease. The only type of case in which it might be considered is in extensive unilateral disease involving more than one lobe and associated with a large amount of offensive sputum, marked toxic symptoms and recurrent pyrexia, due to septic bronchopneumonia. It will not obliterate all the cavities but may, by diminishing the extent of the disease, bring about some improvement in the symptoms.

Drugs in the Treatment of Bronchiectasis.

A large number of drugs have been employed at one time or another with the object of modifying the morbid state of the bronchial mucous membrane and of preventing or arresting the decomposition of the secretion. Of these *creosote* is the most popular. Although there is no very conclusive evidence that it has any direct effect in the mucous membrane of the bronchi or its secretion it certainly is of great value in deodorising the breath. It can be administered in a variety of ways:

- (1) In gelatine capsules. Dose, 2 minims three times a day.
- (2) One ounce of the British Pharmacopœia mixture.
- (3) In the following mixture:

R/Creosote	...	...	...	...	...	...	...	...	mii
Tincturæ chloroformi compositæ	...	...	...	...	...	...	...	...	3ss
Glycerinum	...	...	...	...	...	...	...	...	3ss

Misce, fiat mistura. ʒi in milk three times a day

(4) In cod liver oil: 2 minims of creosote in 2 drachms of the oil, three times a day.

(5) It is, perhaps, most valuable as an inhalation, a few drops being put on the sponge of a Yeo's respirator.

Tar has also been used for the same purpose as creosote and in a similar manner. By mouth it may be given as the "Elixoid" Picis Comp. (B. W. & Co.), a pleasant product to take. Pinol may be added to hot water (3 drops to the pint) and inhaled or used in a spray producer.

Turpentine is another useful drug. It may be given by the mouth:

R/Olei terebinthinæ	...	...	...	...	miss
Mucilaginis acaciæ	...	...	...	...	ʒiii
Misturam amygdalæ	...	...	...	ad	ʒi

Misce, fiat mistura. Dose ʒi

or as an inhalation in hot water (of the oil of turpentine to the pint), or the patient may wear a Yeo respirator, the sponge of which is charged from time to time with spirits of turpentine.

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