# THE SURGICAL ASPECTS OF CHRONIC PULMONARY SUPPURATION.

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*Bruce M. Dick.*—It is our purpose to emphasise those aspects of the treatment of suppuration of the lung which are more definitely surgical, for it is unquestionable that surgery has a recognised place in the treatment of chronic pulmonary suppuration; we should at the same time like to reiterate the hopeful note sounded by Dr Martin in his outlook on those conditions.

The following review of modern surgical methods is an epitome of our experiences in this and other countries, for we have not had as yet any personal experience in the surgical treatment of those diseases. Rational surgical treatment must always depend upon as thorough an appreciation as possible of the fundamental pathological anatomy; and in the treatment of those diseases, the peculiar physical conditions of the thorax make such knowledge more than ever necessary. We will begin by indicating briefly the several pathological types of intra-pulmonary suppuration that are met with clinically; for successful treatment depends upon the recognition of the particular type. There are five main types of lesion:—

(1) *The Uncomplicated Type of Bronchiectasis*, in which the bronchial dilatation is cylindrical or glove-finger like, with or without sacculations, and unaccompanied by any infiltration of lung tissue.

(2) *The Complicated Type*, which is a much graver one. In this variety the bronchial dilatation is associated with numerous suppurative areas in the lung, and these areas communicate with the dilated bronchi through narrow and sinuous tracks lined with granulation tissue. The lung tissue, which is sodden with pus, is atelectatic. Drainage into the bronchial channels is inadequate or impossible. The affected area of the lung is commonly the greater part of the lower lobe, and it may be likened to a marsh, which is notoriously difficult to drain. It is in this type that radical surgical measures are applicable and most useful.

(3) *Bronchiectasis associated with a Chronic Abscess of the Lung.*—In this variety the pathological appearance is similar

to that of the second type. The bronchiectatic process is usually a sequel to the fibrotic infiltrating changes induced by the lung abscess and also to the overflow of pus from the abscess into adjacent bronchi. The abscess has thick and unyielding walls.

(4) *Chronic Abscess of the Lung with Broncho-pleural Fistula and Chronic Empyema.*—This type is usually the result of rupture of a pulmonary abscess into the pleural cavity and, from the manner of its production, is amenable only to surgical treatment.

(5) *Bronchiectasis as a Complication of Bronchial Carcinoma.*—The important feature of this type is that the observer may be misled as to its cause, for the bronchiectatic element in a case often overshadows the cancerous origin of the condition.

In bronchiectasis, although the presence of new fibrous tissue gives evidence of a natural tendency to heal, yet the effect of the new fibrous tissue is that eventually the affected lobe becomes like a very fibrous sponge, the interstices of which are laden with pus. Anatomical and pathological impediments combine to hamper the spontaneous healing and cure of bronchiectasis. For example (*a*) drainage of the abscess cavities is through narrow tortuous channels and against gravity, and is therefore, insufficient; (*b*) obliteration of the cavities by contraction of fibrous tissue is prevented by the rigidity of the thoracic walls (and, indeed, the curative function of the new fibrous tissue is perverted because it actually tends to maintain and increase existing cavities); and (*c*) the inflamed and suppurating tissue is constantly irritated by the movements of ordinary respiration and of recurring cough.

**Diagnosis.**—The diagnosis of bronchiectasis, usually in little doubt clinically, can now be amply confirmed by radiographic methods. By the use of iodised oil it is possible not only to confirm the diagnosis but also to determine the site, the extent, and the character of the pulmonary lesion. Dr Martin has demonstrated how lipiodol may be administered by the bronchoscope; we would, however, recommend simpler methods for diagnostic purposes, such as the supra-glottic and crico-thyroid. These methods are equally efficacious and can be carried out without upsetting the patient. By alteration of the patient's posture any desired area of the bronchial tree can be outlined. Lipiodol administration is without danger and, indeed, many patients experience some relief after its use.

Diagnostic pneumothorax may be specially helpful in some cases by throwing into prominence retro-cardiac opacities, by demonstrating the extent and character of pleural adhesions, and by indicating a previously undetected fluid-level in the lung or pleural cavity. Careful radiographic interpretation is of the greatest importance in determining the kind of treatment that is to be embarked upon. Dr Martin has already referred to the necessity for excluding the presence of aspirated foreign bodies in the lung. The importance of examining the paranasal sinuses is emphasised by Evarts Graham. Many cases of early bronchiectasis have been completely cured by treatment of sinus infection alone.

**The Indications for Surgical Treatment and the Scope of the Operations.**—The essential aims of the local treatment of bronchiectasis are based upon three cardinal principles:—(1) to diminish infection by the provision of adequate drainage and lavage; (2) to rest and immobilise the diseased lung, in order to give the fibrous tissue every chance of contracting and of obliterating the cavities; (3) in cases where these ends cannot be achieved, to extirpate the diseased tissue.

The treatment is by no means standardised; each case must be dealt with according to its individual pathological characters. Methods of internal drainage, such as bronchoscopic lavage and postural drainage, will do much to diminish secondary infection and to promote healing in bronchiectasis of the uncomplicated (glove-finger) type and in those cases in which rigidity of tissue does not prevent spontaneous obliteration.

The cases that most urgently require surgical treatment are those in which the structural changes in the lung and bronchi are maintained by rigid scar tissue that will not yield to conservative measures. When healing by fibrous tissue contraction is prevented by the adhesion of the cavities and dilated bronchi to the rigid thoracic walls, it seems a rational step to create conditions favourable for healing by the adoption of some form of collapse-therapy. Three such methods are in vogue; they may be employed singly or in combination: (1) artificial pneumothorax, (2) avulsion of the phrenic nerve, (3) thoracoplasty.

We will now consider briefly the indications for and the limitations of each of these methods.

(1) *Artificial pneumothorax* is limited necessarily to those cases in which the pleural adhesion is not extensive. In such

cases pneumothorax has been of great value. It demands, however, repeated refills for the maintenance of the necessary pulmonary collapse. It has proved of most curative value in cases of fairly recent pulmonary abscess, especially in the upper lobe, and its usefulness is enhanced when combined with avulsion of the phrenic nerve; these measures in combination have cured many cases of bronchiectasis. This combined method is one advocated and practised by Morriston Davies.

(2) *Avulsion of the Phrenic Nerve.*—This is a simple operation and has a wide field of usefulness. It has now had an extended trial and the results are very gratifying. Some cases are completely relieved of their symptoms, and most cases of bronchiectasis show considerable improvement. The operation is attended with no risk and it may be conducted under local anæsthesia. Phrenic nerve avulsion should always be employed as a preliminary to major undertakings, irrespective of the type of the disease. We suggest that this operation would form a useful adjuvant to the treatment which Dr Martin has described.

(3) *Thoracoplasty* is reserved for those cases which have resisted more conservative treatment. It is a more serious undertaking in this disease than in tuberculosis. It should always be carried out in several stages, and should be of a type adapted to secure the maximum collapse over a minimum area —that is to say, the ribs should be cut according to the extent of the disease. In a few cases the results of thoracoplasty are disappointing, and if the parietal pleura is thick and unyielding little benefit can be expected; but the results in most cases are remarkably good, and, if the operation is judiciously limited at each stage, the mortality is very low. In recent years the advances in thoracic surgery have led to the adoption of a more radical attack by actual excision of the diseased pulmonary tissue. From the pathological standpoint the soundness of this method is undoubted. Evarts Graham, Archibald and Whittamore are the chief exponents of this practice. Graham removes the diseased portion of lung by means of a cautery (cautery lobectomy) after a preliminary exposure of the pleura. The operation, which is not a formidable one, requires several applications of the cautery. Both of us have seen this method of treatment and its results, and we can vouch for its excellence. In Graham's hands the mortality is only 17 per cent.

Modern methods of excision, such as are advocated by Whittamore and Archibald, resemble in principle the Mickulicz colectomy. They have usually been followed by recovery and their operation death rate is low; but they should not be resorted to until other methods have failed.

*C. F. W. Illingworth.*—When attempting to estimate the value of the widely different forms of treatment which have been advised for bronchiectasis, it is, I think, important to bear in mind that this disease may present itself in several quite different forms, each of which has certain characteristic features. It is perhaps for this reason, as much as for any other, that such a variety of therapeutic measures are in use to-day and that each measure has its own particular band of enthusiastic supporters. Each line of treatment, no doubt, is best suited to certain types of case; no method, alone, will find universal applicability.

Surgical treatment of bronchiectasis may be called for in either of two circumstances. It may be employed either as an adjuvant to other, medical or bronchoscopic, lines of treatment, or it may be resorted to only when these have been tried and have failed. We believe that it is in the former circumstance that surgical intervention offers the best prospect of affording benefit.

The surgical measures which may be employed fall naturally into two groups. The first group includes the more conservative operations which are designed to give rest and comparative immobilisation to the affected lobe. In the second group are those more radical measures which aim at a complete extirpation of the disease.

*Phrenicectomy.* — The object of this procedure, which paralyses the greater part of one half of the diaphragm, is two-fold. It causes a great diminution in the diaphragmatic movements, which, on the affected side, become entirely passive, and the closely applied bronchiectatic lobe is thereby rendered immobile. Later, as the paralysed muscle atrophies, it rises high in the thorax, thus allowing the cavities to diminish. The phrenic nerve, arising in the neck from the 3rd, 4th, and 5th cervical roots, frequently receives contributory fibres from other cervical nerves which join it lower down in the thorax. To gain a sufficient paralysis of the diaphragm it is necessary to interrupt these contributory fibres, and it is therefore

insufficient merely to divide the phrenic nerve in the neck. Instead, the nerve, after exposure at the root of the neck, is removed in its entirety by gradual avulsion, so that, on pulling away, it tears across all contributory fibres. The operation is entirely free from danger. Its technique presents no great difficulty in the average case. The nerve is exposed under local anæsthesia as it crosses the scalenus anticus muscle and it is cut through. The lower end, gripped in forceps, is then slowly extracted from the thorax, and eventually, after several minutes' steady traction, its whole thoracic portion may be removed. Apart from a twinge of pain at the moment of the final separation, the patient experiences little inconvenience, and the diaphragmatic paralysis in no way interferes with normal respiration.

This minor operation of phrenicectomy is one which, even when used without other methods of treatment, has been found of distinct value. We feel, however, that its real place is as a measure complementary to such treatment as medical drainage and bronchoscopy. One of the most striking results of phrenicectomy is the almost immediate reduction in the amount of sputum. Thus in a recent case of tuberculosis the sputum a few days after operation was reduced from 10 oz. to ½ oz. In addition the patient usually experiences considerable relief from the distressing cough. In virtue of its simplicity and safety phrenicectomy is a procedure which can be confidently recommended even in enfeebled subjects.

*Thoracoplasty.*—The type of thoracoplasty employed for bronchiectasis is different in many respects from the one advocated in pulmonary tuberculosis. For tuberculosis, thoracoplasty is now a sufficiently standardised procedure; if a proper selection of cases is made, the risks of operation are small, and it can safely be performed in two stages. In bronchiectasis, however, the patient's general condition necessitates greater caution, and it is advisable that rib resection should be carried out at several sittings. As this operation can also be carried out chiefly under local anæsthesia, with a little gas and oxygen, the several stages are well tolerated. The technique of the actual operation presents no difficulty, subperiosteal resection of the ribs being carried out through suitably placed incisions. As the disease usually affects the lower lobe of the lung, it is customary to resect only the lower ribs, and it is rarely necessary to extend the operative field

higher than the fourth rib. No attempt is made to do more than a mere rib resection, and the shock associated with widespread trauma of the chest wall is thus minimised.

In those cases where these more conservative measures fail, and where the somewhat gloomy prospect justifies more heroic treatment, actual removal of the diseased lobe may be practised.

*Cautery Pneumectomy.*—This operation, which is carried out extensively by Evarts Graham, is performed in two or more stages. The first stage consists in gaining access by the removal of two or three ribs over the affected area, and in fixing the lung to the parietes. At a later stage the diseased tissue of the lung is removed by the bold employment of the actual cautery. By this means most of the diseased area is destroyed, and the remainder is afforded adequate drainage by numerous bronchial fistulæ which, however, usually close spontaneously.

The operation of *lobectomy* by the old one-stage method fell into disrepute owing to its high mortality rate. Lately, however, a modified method has been introduced, comparable to the Mickulicz operation for colectomy. The affected lobe is first brought outside the chest wall and fixed in this position, and at a later date is excised or cauterised. Though at first impression this is a formidable operation, the published results indicate that it may not be unduly dangerous.

In conclusion, we should like to urge the necessity for close co-operation between all those engaged in the study and treatment of chronic suppurations in the lung, for only in this way can future advances be achieved.

## Discussion

*Dr Logan Turner* thought the Society was to be congratulated on the way in which this subject had been presented from the endoscopic point of view by Dr Ewart Martin and Dr Hall; the collaboration of Mr Bruce Dick and Mr Illingworth had given it a completeness which it would not otherwise have had. Dr Martin had spent much time and given a great deal of attention to endoscopy, and he had now developed a technique which was very safe in his hands. He (the speaker) could recall the early days of the use of the bronchoscope in the Ear and Throat Department and, watching the staff in the department to-day, he realised the very great advances that had been made in that line of work. He thought the case had been fairly stated and that those who

had spoken had done so in no exaggerated way, but had taken a very level view of what results bronchoscopy could accomplish. The subject lent itself to considerable discussion.

*Dr Fergus Hewat* said—Non-tuberculous, chronic pulmonary disease has been the despair of the physician for generations, in so far as actual curative treatment is concerned. For some years now I have taken a considerable interest in such conditions, and I have followed Dr Martin's work with much interest, and have been fortunate enough to have been allowed to co-operate with him and his colleagues in a good many of his cases.

From the point of view of a practising physician, I am quite clear that endoscopy has opened up a new field for diagnosis and treatment in such patients, specially those who show evidence of passing into the stage of bronchiectasis. I think one of the most important points we physicians have to keep in mind is the pathology of acute disease of the lung and pleura. In acute pulmonary or pleural disease—other than tubercle—we can confidently look forward to a process of recovery by *absorption*, and this relatively quickly. In not a few cases, however, recovery takes place by *organisation*, and this slowly. Why one case recovers quickly by absorption and the other slowly by organisation is not very clear, but the presence or absence of pus may be a potent factor in deciding the ultimate result. Dr Martin's work clearly points out to the physicians that they must realise quickly that, in a certain case, recovery by organisation is likely to take place; and before this goes too far endoscopy should be tried—provided always that strenuous endeavours have previously been made to find pus by the use of a satisfactory needle and syringe. I am not altogether sure that chronic pulmonary disease is not at times due to an undetected empyema or, when the empyema has been detected, to ineffective drainage. We are not justified in settling down to the creosote, cod-liver oil, postural coughing routine of our forefathers till we have "explored" the lung from every aspect. I have recently had three cases which have passed on to bronchiectasis, and where incomplete drainage was established in the presence of a pneumococcal empyema.

After an experience of over six years, I am thoroughly satisfied that endoscopy should be carried out early; that the results, even in late cases, are unique; and that this form of treatment has changed many cases of bronchiectasis from a state of incurability to one of curability. I would emphasise the instance of the lady's maid. I saw her first five years ago. The diagnosis was simple; but her condition was serious and her work had gone. She was a nervous wreck and I wondered if she would stand bronchoscopy. The result was that the first treatment was trying; but the feeling of well-being and the loss of foul odour to the breath was so great that, in spite of her trying ordeal, she asked

two or three days later, "When can I have my next treatment, please?"

Cases of bronchiectasis are not always easily diagnosed if we are guided entirely by text-book descriptions. For example, during the past ten years I have not seen the typical three layers in the sputum which are so constantly described in text-books. Further, I have always been rather dubious about the value of lipiodol pictures when this substance has been introduced by the usual route with a hypodermic syringe. To-night I am convinced that the bronchoscopic route is the only one that gives clear detail as to actual cavities.

The use of the bronchoscope in the treatment of bronchiectasis does not appear to have attained the favour due to it. In a recent publication entitled *A Text Book of Medicine by Various Authors*, published this year in Edinburgh under a London editorship, no mention whatsoever is made of this mode of treatment which has now been in vogue in this city for six or seven years. In Price's *Text Book of Medicine*, first published in 1922, the following sentence occurs in describing the treatment of bronchiectasis: "Vaccines made from the predominant organisms found in the sputum have been given with some benefit." This sentence is repeated in the second edition, published in 1926. I have never been able to understand what this really means, and I would ask Dr Hall if he can explain it. From his paper it seems clear that there is no actual causative organism. What then is meant by the "predominant organisms"? Does it mean those which are cultivated most easily, or the most toxic? It seems to me to be quite contrary to surgical principles to give vaccines without insuring complete drainage. This cannot be done without the bronchoscope. I have learned a great deal in chest examination from what Dr Martin and his colleagues have told me, and I should like to thank them cordially for the opportunities they have given me to see interesting and instructive cases. I trust that our method of physical diagnosis, where we can use only the outside of the chest, has not fallen completely into desuetude, although perhaps it has been relegated to a back seat.

*Dr J. S. Fraser* said—In Edinburgh we see very few cases of foreign body in the lower air passages, though all of us have to deal with many foreign bodies in the hypopharynx and œsophagus—mostly halfpennies. I think that my own experience of foreign bodies in the bronchi amounts only to two—a pearl-headed pin and a glass bead. I have had only one case of tumour of the lung. I have, however, had quite a considerable experience in the taking of swabs from the trachea and bronchi in order to obtain cultures for the making of vaccines in the treatment of asthma. In all these cases the bronchoscopy was carried out with the aid only of local anæsthesia. As a rule a bacterial growth, which Professor Meakins and Professor Murray Lyon regarded as satisfactory,

was obtained. It would be very interesting if we could obtain the results of vaccine therapy in these cases of asthma.

With regard to the treatment of bronchiectasis I was interested in the straightforward account which Dr Martin gave of his work. He admitted that all the cases were not successful and that a certain number had died—mostly from other causes and not as a result of treatment. I should like to know what proportion of patients with bronchiectasis willingly return for treatment. I expect that the majority find sufficient benefit to make it worth while to return, but that a certain number of the more nervous patients dislike the treatment and fail to appear. I think that Dr Martin claimed twelve cures in 61 cases, *i.e.*, about 20 per cent: this appears to be fairly satisfactory.

*Dr Goodall* said—Like Dr Hewat, I am interested in the passing of what may be called the "creosote period." I think there must be few of us who really believe that we can do anything in the way of disinfecting the lung by upsetting the patient's stomach. I was a little surprised, however, not to hear one measure referred to—a measure I first saw used by my old Chief, Dr James, who explored chests with needles at a time when it was not fashionable to do so; and one of his favourite methods was the intra-tracheal injection of menthol in liquid paraffin. I still think that a very useful remedy, and I think it has to a much greater extent the advantage that washing out has that of displacing residual air. Any successes from vaccine therapy which I have got have been just as good whether I have used a specific vaccine or not—just as good from peptone, or even better with T.A.B.

*Dr W. T. Gardiner* said that he did not consider patients had such great discomfort with the examination. He did not see so many cases as Dr Martin, but remembered a case of commencing bronchiectasis which he had examined by the bronchoscope and found a dilated bronchus filled with pus which he had removed by suction. The patient objected a little to the examination and he did not think she would return. However, a fortnight later she returned because she had had considerable relief in the meantime but she thought the pus was collecting. Four similar wash-outs cleared up the condition finally. He thought that operation of avulsion of the phrenic nerve ought to be a great help in the treatment of simple bronchiectasis as it would tend to contract the cavity from below upwards. He was not greatly impressed with the treatment of the asthma cases and was sure that if it had been of real value Dr Martin would have continued to work with the asthma cases as there were far more sufferers from asthma than from bronchiectasis.

*Dr Martin*, in reply, said—Dr Fraser has evidently been under the impression that we have been using a general anæsthetic in some of

the asthma cases which have been sent to us for swabs from the subglottic regions. General anæsthesia is unnecessary and therefore should not be used in endoscopic work. It is perfectly simple to pass a bronchoscope without an anæsthetic at all in a child aged 8, above that a local spraying of cocain is all that is necessary. In our experimental work on the chest we could not ask a normal person to submit to bronchoscopy, with the purpose of obtaining a swab from a normal chest. We therefore took the opportunity of examining with a bronchoscope patients who were under a general anæsthetic for routine ear operations, and whose chest we considered normal. In the Ear and Throat department intra-tracheal ether is our routine general anæsthesia, so it was very simple to pass a bronchoscope before passing the tracheal tube and thus obtain an uncontaminated swab. In many cases the swab was sterile, and thus led to further experimental work using different forms of anæsthesia. We have not given up the bronchoscopic treatment of asthma, but meantime asthma patients have not been able to obtain bed accommodation in our wards as there are so many other cases awaiting admission. I should not like Dr Fergus Hewat to continue to think in any way that we are pushing the physician into a back seat. He has to correlate all the various reports, decide and superintend treatment. Bronchoscopy should thus be used merely as an incident in diagnosis and a means of treatment.

*Dr I. Simson Hall*, in reply, said—Leaving aside for the moment the question of advisability of treatment by vaccines, the multiplicity of organisms found in these cases would render anything in the nature of a specific vaccine a difficult thing to prepare.

Recently, Joannides has brought forward some evidence to show that what he calls a fuso-spirochæte is responsible for some cases of suppuration. He proves that this organism can be demonstrated in all lung abscess cavities. We very frequently get spirochætes of refringens type in particular, and I have discussed on many occasions in the Bacteriological Department the likelihood of being able to prove these responsible for the suppuration; and I hope, with the co-operation of Mr Band, to be able to give a little more information on this point in the near future; but so far I do not think there is sufficient evidence for the belief that a causal organism is likely to be isolated.

As regards the advisability of vaccine treatment, the question of vaccines is quite apart from the real surgical principle which should be complete drainage, first and foremost, to promote, as far as we can, the healthy lung condition, which is our aim; and until we have accomplished this, nothing in the nature of a vaccine is likely to render any real help in the matter.

*Mr Bruce M. Dick*, in reply, said—In regard to the question of the diagnostic methods employed, I would like to make a little correction

on what I said in my paper. We do not want to cast any adverse criticism on the bronchoscopic method. I have had no personal experience of administering lipiodol by this method, but I have a certain amount of experience of the other methods, and on looking at the plates, and comparing them with those obtained by the bronchoscopic route, I do not think there is a great deal of difference in the information obtained by each method, except in special circumstances. I admit quite freely that I am in favour of using the bronchoscopic method in conjunction with treatment, but for simple diagnostic purposes the other two methods are so extremely simple that, from the point of view of diagnosis, they have a definite place.

*Dr Woodburn Morison* also took part in the discussion.

**Meeting**—1st May 1929.

Dr A. LOGAN TURNER, President, in the Chair.

PRIVATE BUSINESS.

Ion Simson Hall, M.B., F.R.C.S., was admitted as a Member of the Society.