

7

Branchiectasis:  
a Thesis.

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During the time that I held the appointment of House Physician at the Brompton Hospital for Consumption, I had many opportunities of seeing and watching the progress of patients suffering from Bronchiectasis, and I shall endeavour to describe the result of my clinical and pathological observations of this distressing disease, illustrating the latter by drawings taken by myself from prepared specimens, and giving an account of cases of interest I have met with.

# Bronchiectasis.

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## Etiology.

Bronchiectasis was first noticed as a distinct condition in the year 1808 by Carrol, who was a student of medicine in Paris at that time, and he brought his observations before Laennec, who was the first to describe this disease in detail.

Bronchiectasis, or dilatation of the bronchial tubes, is a rare disease hardly ever occurring primarily: only a limited number of cases are described as occurring congenitally.

It is essentially a secondary affection of the bronchi following pre-existing disease of a usually chronic nature,

and occurring at almost any period of life, though generally speaking middle aged people of either sex, males perhaps oftener than females, are the sufferers.

It is a disease which maybe acute, but which as a rule runs a chronic course, the onset is insidious, and those who are continually exposed to a wet or damp climate and whose occupations are arduous, are more likely to develop this condition on account of repeated attacks of chronic bronchitis, which weaken the bronchial walls and consequently lower their resisting power, than others in better circumstances and in a dryer atmosphere, where bronchial affections are not so prevalent; but notwithstanding this, bronchiectasis may quite likely follow upon an acute attack of bronchitis.

The development of bronchiectasis is aided by two main conditions, viz: pressure within the bronchial walls and mechanical dragging outside them, and while these two factors usually cooperate, the former one is the most important.

Acute and Chronic Bronchitis are both intrinsic causes of bronchiectasis. The inflamed bronchial walls becoming weakened through deficient elasticity and impaired muscular power, tend to dilate both on account of the severe strain put upon them by the act of coughing and the pressure within them of a large quantity of secretion, which reaccumulates after being expelled by coughing, and this further helps to increase the dilatation not only in the tubes affected, but in adjacent ones: possibly some bronchi at the base are never quite empty. As a result of this, emphysema may occur around the bronchi, but a marked condition of this concurrent with bronchiectasis is rare, and the surrounding pulmonary tissue is

usually fibrous and contracted, or may even be healthy, & thus help to increase the tendency of the tubes to dilate.

Other modes of the intrinsic production of bronchiectasis are the impaction of a foreign body, as a tooth or piece of bone, in a bronchus (Figs: 1.2.3.) or the gradual contraction of a bronchus due to disease such as Syphilis (Fig: 4), and such causes result in dilatation of the bronchial wall beyond the seat of constriction.



Fig. 1.  
Section through a lung showing Right bronchus obstructed by a piece of bone.  
Bronchiectasis.



Fig. 2.  
Fibroid induration and Excavation of a Lung, due to a tooth impacted in a bronchus.  
Bronchiectasis.

Fig. 3.



Ear of Corn in the right lower bronchus:  
Bronchiectasis: Atelectasis.

Fig. 4.



Syphilitic scarring and  
consequent stricture of the Trachea  
and both Bronchi.  
Bronchiectasis.

In the former case the lumen of the tube is suddenly obliterated, collapse of that particular area of lung takes place - or emphysema may be set up either in the affected or unaffected lung - and bronchial dilatation arises from the consequent expulsive efforts to dislodge the foreign body: in the latter instance, obliteration wholly or partially is gradual, and the tubes become dilated over a large area.

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and consequent dilatation of the bronchi beyond, may be the result of pressure from an intra-thoracic aneurysm or a new growth in the mediastinum, or by enlargement by disease of lymph glands, and once the dilatation is established, it becomes increased by coughing and by secretion collecting and remaining in situ.

Extrinsic causes of Bronchiectasis may arise from Pneumonia or Broncho-pneumonia, where resolution has been imperfect or absent, and there is collapse of lung tissue. Cirrhosis of the lung and chronic pulmonary Tuberculosis (vide Fig: 5 on next page), fibroid Phthisis especially, are fairly common factors in the production of bronchial dilatation, as are also Emphysema and Pleurisy with or without effusion, and particularly in those cases where the pleura is much thickened, and there are extensive adhesions present.

Laennec was the first to assign the production of bronchiectasis to a primary pleurisy causing inflammatory

Fig. 5.



Bronchiectasis following  
Apical Tubercle.

[Excavation and caseous degeneration at apex  
of lung]

processes in the connective tissue of the adjacent lung, and consequent contractions which favoured bronchial dilatation, and, as already stated, one of the modes of production of bronchiectasis is still considered to be due to a mechanical dragging outside the bronchial walls, i. e. by fibrous adhesions stretching

8  
from a thickened pleura to a bronchus,  
or from one bronchus to another. But  
authorities now differ as to the importance  
of this factor partly because of the  
uncertainty of the presence of adhesions  
which has often to be left to conjecture;  
however, when they are present they  
possibly help somewhat to cause dilatation,  
but probably would not do so, unless  
aided by the presence of secretion within  
the diseased and weakened bronchial  
walls, and the extra pressure of air  
within them during violent coughing.

Bronchiectasis occurs in children  
and may run a very acute course,  
though it is usually chronic. It may  
follow an attack of bronchitis after  
measles, whooping-cough, or diphtheria,  
especially if the child is syphilitic  
or rickety, in which latter case the  
probable deformity of the chest wall  
will be a predisposing cause of the disease.

Morbid Anatomy.

There are two

principal forms of bronchiectasis,

- ① The cylindrical or uniform dilatation,
- and ② the saccular dilatation of the bronchi, and both conditions which may be general or partial may coexist, especially in advanced cases.

A third variety is described and is called 'Mouliiform', but this is very rare, and consists of small dilatations

Fig: 6.



Section through a Lung showing Cylindrical Bronchiectasis.

10  
in the course of a bronchus not otherwise enlarged.

The cylindrical variety (Fig. 6) is the commonest met with, and consists of a series of dilated bronchi stretching out into the lung substance like the fingers of a glove, and usually involving the large and middle sized tubes; they vary in size from one another and may in places be half an inch in diameter, and one part of a bronchus may be more dilated in its course than another part. These dilatations may end abruptly or gradually.

The saccular variety (Fig. 7 on next page) which is said to start in the terminal bronchi, is characterised by one or more dilatations in the course of the bronchi which commonly, though not always, end in a round cavity or sacculus of variable size, some being as large as a five shilling piece, while others may be small enough to escape notice unless examined

Fig: 7.



Section through a lung showing Sacular Bronchiectasis.

microscopically; sometimes a bronchial tube is found completely obliterated beyond such a dilatation.

Bronchiectasis may be present in one or more lobes of the same lung, and may involve both lungs, but as a rule it occurs in the lower lobes, especially in chronic bronchitis, where more tubes are dilated than in

12

acute conditions where dilatation is perhaps not so extensive e.g. after collapse of an area of lung following a lobar pneumonia or pleural effusion.

In tuberculous cases the upper lobe and apex may be the seat of bronchiectasis, although in non-tuberculous lesions this has been seen, as in a septic bronchopneumonia where the dilated bronchi terminated in gangrenous cavities (Case 4).

In the affected bronchi the mucous membrane shows signs of inflammatory changes, which are acute or chronic according to the length of time the disease has lasted: in the former case it may be red raised & swollen, and in the latter case of a greenish or grey colour with at times a distinct membrane, sometimes granular, sometimes smooth and glistening in appearance; signs of general bronchitis are invariably present.

The bronchial wall is usually thickened, and this is due to increase

13

of fibrous tissue, or the wall may be thinned out in places and show signs of ulceration, which during life may have involved a vessel and so given rise to haemorrhage.

The cartilages of the bronchi are usually unaffected, but in long standing cases they may become softened and eroded.

Microscopically, the dilated bronchial wall shows considerable change as a rule; the ciliated epithelium has usually quite disappeared and is replaced by stratified epithelium, below which there is an increase in the amount of fibrous tissue, and the muscular fibres are seen to be stretched, fibrous, and atrophied, while the elastic tissue is often deficient & broken up.

The tubes may be full or empty after death; they usually contain a quantity of greenish yellow putrid secretion, often stringy, which is very offensive, or sometimes a

12  
Thick clear non-purulent fluid  
may be present. An isolated  
sacculle may be found full of  
decomposing material, and crystals  
of fatty acids may be seen.

The condition known as  
Bronchiectasis is found in the  
lungs of children, where the minute  
terminal bronchi are in a state  
of dilatation and surrounded by  
inflammatory change; this is  
comparatively rare, and may only be  
discovered upon microscopical exami-  
ation.

On section, the lung tissue between  
the dilatations may be seen to be  
unaffected & normal, but it is  
generally densely fibrosed or collapsed,  
because of localised pneumonia or  
pressure; it is sometimes emphy-  
sematous, and in the saccular  
variety, very little lung tissue may  
be present at all if the condition  
is far advanced and the sacculles  
are very numerous. Gangrene

and abscess formation may occur ultimately in the affected pulmonary tissue. The pleura is sometimes thickened, and the connective tissue between the lobes and lobules of the lung is often considerably increased; the thickening of the pleura may occur coincidently with the general pulmonary fibrosis secondary to bronchial dilatation, or may in itself be a primary condition.

As a result of the chronic bronchitis, the right side of the heart may be dilated and hypertrophied, and consequent chronic venous congestion seen, affecting other organs principally the liver and kidneys, in which signs of chronic nephritis may be present.

Pneumothorax has been known to develop in the course of bronchiectasis, possibly as the result of an ulcerating and suppurating focus causing perforation of the pleura, or by the bursting of an

overdistended sacculi into the pleural cavity, but this is by no means common.

Pericarditis may be present.

Waxy disease of internal organs, usually the kidneys and liver, may occur in advanced cases on account of the prolonged suppurative process in the bronchi, and septic emboli may be carried by the blood stream to the brain, and there set up abscesses.

## Symptoms and Physical Signs.

In a typical case of bronchiectasis the face is often drawn and the expression anxious: the body may be bent and badly nourished, and the patient usually only too fully realizes what a misery he is to himself and his friends, except in some instances, when he may not be conscious of the factor that surrounds him. There is paroxysmal cough generally upon lying down, and sudden expectoration, often profuse, of usually foetid secretion from the bronchial tubes; it may come up in gushes especially if the tubes are sacculated, and relief is then experienced for a time after the tubes are thus emptied - but the secretion will re-accumulate either slowly or quickly according to the severity of the case, and its presence stimulates either the affected or unaffected bronchi, often the latter, causing further cough and expectoration. The sputum may not at first be offensive, but as

18

time goes on it becomes markedly so, the odour being like that of rotten cabbage: sometimes the breath is more offensive than the actual secretion.

The total quantity expectorated in the 24 hours may exceed even 30 ounces in severe cases: usually it is less; it is grey brown or grey green in colour, and after standing for a time in a conical glass, the sputum collected during 24 hours shows well marked characteristics by separating into three distinct layers, the lower of which is composed of a thick purulent mass in which the solid material has granulated, while the middle layer is thinner, mucoid, & stringy, and upon the surface of this is a grey or brownish froth. Microscopically pus cells are in abundance, and streptococci may be seen as well as crystals of fatty acids and haematin; elastic fibres and spirals of leptothrix may be present, also small cheesy

masses called Traube's plugs.

Tubercle bacilli are absent, and even in tuberculous cases are not always discovered.

Dyspnoea may be present especially on exertion, and in cases of bronchitis and emphysema; cyanosis varies in degree, and depends upon the strain put upon the right side of the heart by congestion of the pulmonary circulation.

'Clubbing' of the fingers with incurving of the nails towards the palm of the hand, is a constant and fairly diagnostic sign of bronchiectasis: the toes often show the same phenomenon in a lesser degree, and sometimes the nose is clubbed.

This condition, which has been described as 'Hippocratic deformity of the fingers', has long been recognised in many forms of pulmonary disease, and Trousseau describes it as a contraction of the ungual phalanx with enlargement and thickening of the digital

20

pulp; the onset is usually gradual, it is rarely rapid. The parts so affected assume the form of a club, and are often flattened and cyanosed, and skiagraphs have repeatedly shown that the bones are not enlarged.

Attacks of Haemoptysis, whether slight or severe, are not uncommon during the course of the disease, and may be considerable if an aneurysm on a branch of the pulmonary artery be ruptured, as was probably the cause of the large haemorrhage occurring in the last of the cases which I shall describe; haemoptysis is usually a late occurrence in the disease and may be severe enough to cause death; blood stained sputum may occur at any time.

Constant pain in the chest or side is often present, and is generally due to pleurisy.

Pyrexia sometimes occurs, and may be the result of septic absorption from the purulent secretion in the

bronchi, or localized pneumonia or broncho-pneumonia supervening.

Emaciation and night sweats may be present even if the cause is not tuberculous, and diarrhoea and albuminuria will result from waxy disease of the intestines and kidneys, following prolonged septic absorption.

The Physical Signs in the chest are many and varied, since they may arise from numerous causes, the result of which is bronchial dilatation.

The chest may be barrel-shaped or retracted from previous disease - or show little change from the normal.

Palpation will reveal increased vocal fremitus if there is much fibrosis, but this will be diminished in old cases of pleurisy.

The percussion note will be hyper-resonant in cases of emphysema, and it may be tympanitic over a large empty sacculæ; usually it is dull if there is extensive bronchial

dilatation and pulmonary fibrosis, and this is increased and 'boxy' in character if the tubes are full of secretion.

On auscultation, various degrees of bronchial breathing may be heard, which will be of the cavernous type if saccules are present and empty. The 'veiled puff' of Skoda, or Laennec, may be recognised, and when present is often considered typical of bronchiectasis: it occurs after inspiration, and sounds as if a puff of air had suddenly rushed into a cavity.

Here & there bronchophony may be detected. The adventitious sounds consist typically of numerous coarse râles accompanying inspiration and expiration, and these râles are often loud and creaking according to Dr. Kingston Fowler (like the creaking of a new saddle) or ringing and metallic; they may be bubbling or crackling, according to the amount of secretion present and the state of

the surrounding lung tissue. Post-tussive  
suction and râles occurs in  
phthisical vomicae and are not in-  
dicative of bronchial dilatation.

Diagnosis. True bronchiectasis  
is rare, and other conditions e.g. foetid  
bronchitis and pulmonary fibrosis  
with excessive secretion are somewhat  
analogous and may sometimes be  
mistaken for it, but if most of the  
foregoing symptoms and signs which  
have been enumerated are fairly well  
marked, the diagnosis of this condition  
is not difficult. The presence  
of tubercle bacilli is an important  
factor to take into consideration, as  
in bronchiectasis they are absent,  
and the progress of this disease and  
pulmonary tuberculosis differ considerably;  
still, bronchiectasis does occur in  
pulmonary tuberculosis, although it is  
rare for pulmonary tuberculosis to be  
a sequel of bronchiectasis.

Gangrene of the lung usually presents  
more localised signs in the chest, the

factor is extreme, and it is apt to occur during an acute disease such as pneumonia.

A limited empyema opening into the lung may give signs of bronchiectasis and it is important to distinguish, both from the history and physical signs, between these two conditions, since operative treatment may prove successful in the case of empyemas.

The Prognosis is never very good except perhaps in childhood, where bronchial dilatation has only been slight. The disease runs a chronic course, and may last for many years and not interfere with a fairly active life, except in those cases where there is much collapse of the lung following acute disease, when a sudden termination is not unlikely. The state of the heart and kidneys must be considered; attacks of bronchitis and localised pneumonia are likely to occur, also pericarditis, rheumatoid affections (Gerhardt) and

septicaemia, and the dangers of haemoptysis and cerebral abscess should not be overlooked.

Treatment. The medical treatment of general bronchiectasis is most unsatisfactory, as there is no drug which will cause contraction and healing of the cavities. In a localized large dilatation, surgical measures have been fairly successful, such as incision and drainage, and the case dealt with as one of empyema, but this is not devoid of risk, since it is extremely difficult to be quite certain that there are not other tubes involved besides.

The main indications, therefore, are to keep the patient's health in the best possible state, and the cavities in the lungs empty and free from fœtus: and endeavour to allay the cough and the amount of expectoration, treating at the same time any complications that may arise.

Numerous internal remedies

have been suggested and tried, such as Copaiba, Eucalyptus, the Balsams, Ichthyol, Symp of Garlic, Creosote etc: but little benefit has resulted except perhaps in the case of Creosote, which diminishes the amount of secretion to some extent and acts as a sedative to the cough: these drugs, however, tend to keep the breath less offensive.

Intra-tracheal injections of olive oil containing substances of deodorant and anti-septic properties were once greatly advocated, and are sometimes used, and the best one is that which consists of Menthol 10 parts: Guaiacol 2 parts, and Olive oil 88 parts; this is injected directly into the trachea by the aid of a syringe to the end of which a bent vulcanite tube is attached, care being taken that the nozzle of the tube projects beyond the vocal cords during the process: but this form of treatment has been of doubtful use and is not a pleasant one for the

patients' point of view, be it ever so well carried out. The subcutaneous injections of sterilised oil of guaiacol or creosote has in many instances been tried by Dr. Fowler, but without any striking result being obtained.

Dr. William Ewart, in a paper in the 'Lancet' of July 1901, strongly advocates the consideration of the posture of the patient in bronchiectasis and chronic pulmonary affections, and he saw much relief ensue by persuading a patient, suffering from bronchiectasis, to lie down while the foot of the bed was raised some feet, when the spasmodic cough ceased and the expectoration began to flow freely, and, as time went on, the temperature dropped to normal. He found that the continuous postural treatment, which consisted in keeping the bed raised two feet or more, answered better than the intermittent postural treatment recommended by Quincke, in which the patient was put in the inclined

position with the head lower than the feet, for half an hour, twice or thrice daily. Expectoration is rendered easier, and a thorough emptying of the dilatations, certainly of the cylindrical dilatations, is assured by the postural method, while portions of the lung previously airless can expand.

At Brompton I have seen much relief gained by posture, and have mentioned in some of my cases that the tubes were 'srupted in the usual way', which consisted in the patient lying on his chest and leaning over the side of the bed with the hands upon the floor; coughing was induced by the secretion flowing into healthier parts, and the tubes soon became empty. But only robust subjects are able for this, and feeble patients with dyspnoea on the least exertion are better in the continuous posture if they are bedridden, or they should carry out this recumbent postural treatment

intermittently if able to be up during the day, and at night should always have the foot of the bed raised.

Creasote baths, recommended by Dr. Chaplin some years ago, are distinctly the most beneficial form of treatment in many cases of bronchiectasis, and while occasionally the quantity of expectoration is increased, it usually becomes lessened under this treatment.

At Brompton this is carried out in a small room, and the patient's face is covered with a mask, or the eyes protected from the creasote vapour by pads of wool kept in place by goggles, and the nostrils plugged lightly with cotton wool; (old clothes should be worn, and women should cover up their hair during the bath).

The creasote of commerce is heated in a metal saucer supported upon a tripod, by a spirit lamp, and clouds of vapour soon fill the room; violent cough often results from the

inhalation of this, and profuse expectoration occurs which may cause vomiting, and this is the one drawback to this process - still - the result is that the breathing is much improved and cough and profuse expectoration are absent for some time after the bath. The bath should not last more than a quarter of an hour at first, and only be taken on alternate days; later on it may be taken for a longer time every day, and continued for two or three months or more if well stood; in severe cases the bath should be used continually. In a few cases cure has almost resulted with entire disappearance of the focus, and the general state of the patient and the appetite improve considerably.

In cases where the condition of the patient is too feeble to allow of the taking of creosote baths, the steam from water boiling in an ordinary Bronchitis Kettle to which creosote

is added, gives relief, and under such circumstances it is an advantage to place a tent over the bed.

Compressed air baths are not satisfactory in cases of bronchiectasis, even when much dyspnoea is present: they are most suitable for cases of chronic bronchitis and emphysema without bronchial dilatation, especially if an asthmatic element be present.

The postural treatment of bronchiectasis may be carried out intermittently at the same time as the creasote baths, (but not necessarily during them), with, if necessary, the internal administration of creasote either in capsules or on sugar, or with appropriate tonics such as Cod-liver oil, iron, quinine, or aromatic spirits of ammonia and gentian.

For those suffering from bronchiectasis a dry climate is indicated, with as little variation in the temperature as possible; Egypt in the winter meets these requirements if the patient can afford it, and Bournemouth is said to be beneficial.

The following cases which came directly under my notice during the time that I was at the Brompton Hospital for Consumption will, I think, bear out the various points that I have dwelt upon in the previous pages.

Case 1. Chronic Bronchitis.  
General cylindrical bronchiectasis.  
Cerebral abscesses.

C.R. a boy aged 17 years, with a probable family history of Phthisis, came into Hospital suffering from extreme debility, distressing cough and dyspnoea, night sweats, and profuse expectoration, of five years standing, and his sputum had been gradually becoming offensive and at times streaked with blood, during the last two or three years. The onset of his

present illness was indefinite, except that he had choked over a piece of cutlet bone five years previously, when his cough first began, and it was then doubtful if a portion of this had not been inhaled, as only part of the bone was recovered.

He had always been subject to cold and cough, and had been operated upon for enlarged tonsils and adenoids when a small child; also, he had had three attacks of pleurisy during the last three years. There was no history of any serious illness during childhood.

He was a badly nourished boy and looked more like ten than seventeen: he was emaciated and cyanosed, his chest was barrel-shaped, and he had marked clubbing of the fingers and toes, especially the great toes.

On examining the chest, both lungs showed definite physical signs of chronic bronchitis, the left lung being more affected than the right lung;

54

The râles were coarse & bubbling in character, but no signs of cavitation were anywhere discovered even when the tubes were empty; there was distinct evidence of thickened pleura on both sides and at the bases, but in the latter situation this was not so marked as in the former. The heart and abdominal organs were healthy. There were no tubercle bacilli in the sputum: the urine was normal, but the temperature was irregular, and though never high, showed varying degrees of pyrexia at night. The boy was skiagraphed on account of the possibility of a foreign body in a bronchus, and the result of this was that an elongated shadow was seen on the left side, the size of a half inch Tench nail, which moved with respiration; no cavity was detected.

In spite of paroxysmal cough and profuse and foetid expectoration

33

which occasionally came up in characteristic gushes, nothing occurred worthy of note until he had been in Hospital ten days, and it was after he had been leaning over the side of the bed to clear his tubes that he complained of a sudden pain at the back of his neck; very shortly after this he had an epileptiform convulsion lasting ten minutes, during which there was incontinence of urine: faeces were retained and the tongue was not bitten.

On recovering consciousness he was pale and dyspnoeic, complained of headache, and was terrified lest he should have another fit; later on he slept soundly and on awaking had a severe fit of coughing which caused dyspnoea and some collapse.

During the next five days he complained of sensations like electric shocks in the right arm, together with headache, dimness of

vision and dizziness, and had had three more slight epileptiform seizures, the last of which had left him with intermittent twitchings of the right arm and leg, and of the left side of the face and mouth.

Later, he complained of his right arm and leg feeling 'heavy and useless', and exaggeration of the right patella and right plantar reflexes, together with definite ankleclonus, were found present; on attempting to walk which he was barely able to manage with much help, he dragged his right foot after him along the floor.

The following day the right arm and leg and the left side of the face were paralysed, and no reflexes were present in the right leg which had been the seat of such marked exaggeration the previous day; also, the twitchings of the left side of the face and mouth had now quite ceased, whereas the day before

They had become more marked and frequent, and at times had lasted more than ten minutes. These twitchings usually began gradually at the angle of the mouth, then the whole of the left side of the face was thrown into a violent succession of spasms, which became very intense and only subsided by degrees; these phenomena, coupled with his pulmonary symptoms which became more severe, served to render his condition most pitiable.

His articulation became somewhat slurred after paresis had set in, but he did not lose his power of speech, and complained particularly of not being able to see plainly, and it was found on roughly examining the extent of his visual field, that there was well defined right hemianopia.

Ophthalmoscopic examination showed no definite changes from normal, except that the left optic

disc was rather paler than the right: there were no signs of commencing optic neuritis in either eye.

His condition now rapidly became worse: headache increased and vomiting set in for the first time and continued, being quickly induced by the taking of even the smallest quantities of the lightest nourishment: the abdomen showed some retraction.

The pupils which had been widely dilated for some days now became unequal, the left being contracted and the right slightly dilated; he became more dyspnoeic and cyanosed, was unable to expectorate, and eventually sank into a comatose state and died twelve hours after the commencement of coma.

During the last three days that he was alive, his temperature was markedly subnormal.

At the post-mortem examination:-

Both pleurae were found to be slightly adherent all over.

The great bronchi throughout both the lungs showed marked cylindrical bronchiectasis, especially in the left lower lobe (Fig. 8); their

Fig. 8.



Section through the left lung showing general cylindrical Bronchiectasis.

(To illustrate Case 1)

walls were thicker than usual and were red and inflamed: they contained no offensive secretion, nor was there any foreign body discovered.

Here and there, the terminal ends of the cylinders beneath the pleura were larger than the rest of the dilated bronchus, but no saccules were found.

The lung tissue was very little altered: in places it was firmer than usual and a few scattered tubercles were present in the right upper lobe.

On opening the brain, three superficial abscesses were found, each the size of a pigeon's egg and full of greenish pus.

- ① One was situated in the upper portion of the left motor area, extending on either side of the fissure of Rolando (see Fig. 9 on next page), which would account for the affection of the right arm and leg during life.
- ② Another abscess was found over the facial area on

41  
Fig: 9.



Section through a portion of the Cerebrum  
showing an abscess cavity involving  
the left motor area.

(To illustrate Case 1)

the right side, and explained the left facial paresis. (3) The third abscess was situated on the right occipital lobe, which would account for the right hemianopia during life: i.e. inability to see objects upon the left hand side.

All the other organs were natural.

This case

is of interest on account of the presence of chronic bronchitis leading to bronchiectasis in one so young, and the sudden occurrence of cerebral abscesses, their distribution, and the marked and definite nervous symptoms to which they gave rise.

Operative interference was suggested and abandoned, as the symptoms seemed to point to an abscess of the pons varolii, to say nothing of the possibility of these being other foci of suppuration elsewhere, either in the brain substance or on the cortex cerebri.

A tuberculous lesion was discovered in the right lung after death, although no tubercle bacilli were found on examining the sputum during life - (a not unusual state of affairs in cases of bronchiectasis and pulmonary tuberculosis), and the shadow seen in the left lung by the Röntgen rays was probably only due to a collection of secretion in a bronchus, since no foreign body was found after death.

During the earlier part of his time in Hospital most relief was obtained by regularly emptying the contents of his tubes in the usual way, but no drug, whether sedative or expectorant, gave him any ease from his pulmonary symptoms; and only a temporary sedative condition was effected by the administration of the bromides of potassium and soda at the onset of the convulsions, which was continued almost up to the last.

Case 2. Empyema.  
Bronchiectasis.  
Cerebral and cerebellar abscesses.

M. a female aged 27 years, gave a history of good health and no serious illnesses until five years previous, since when she had had a series of attacks of severe haemoptysis of sudden onset, and had latterly been under treatment for 'inflammation of the lungs and pain in the right side'.

When first seen her cough was severe, especially when lying on the right side, and her expectoration was profuse and yellow and most offensive; no tubercle bacilli or elastic fibres were found in the sputum after repeated examination. Pain in the right side was a constant symptom, and she suffered from dyspnoea and night sweats; the urine was slightly albuminous, and the temperature was  $101^{\circ}$  F.

45

The movements of the right side of the chest were bad.

The percussion note was impaired over the upper part of the right lung front & back, and was dull at the base.

The breath sounds were harsh and somewhat bronchial, and coarse crepitations, especially marked at the apex, were heard all over the right lung; there were no signs of excavation.

The left lung was unaffected as was also the heart, and the abdominal organs were normal.

During the next month the sputum continued offensive and profuse, amounting sometimes to 20 ozs: in the 24 hours: it did not come up in gushes; the cough and dyspnoea, however, improved, and the physical signs at the base of the right lung gradually diminished. The crepitations being less, and a few scattered mucous râles being present - but at the right apex the breathing

became more tubular, and whispering pectoriloquy and bronchophony, together with increased vocal fremitus and dullness on percussion, were present over this area.

The temperature, which had been irregular though never high, suddenly rose to  $102^{\circ}\text{F}$ . at the end of her fifth week in Hospital, and shortly afterwards a swelling appeared below the right clavicle which increased in size and was very painful.

As this swelling continued to increase and ill-defined fluctuation was present, an incision was made, under an anaesthetic, into it, parallel to the second rib, and pus was at once found below the pectoral muscles, in an opening near the edge of the sternum, which led to a limited empyema occupying the upper part of the chest; the first and second costal cartilages were removed and the cavity drained.

The patient made fair progress

7  
during the next three weeks following the operation, her general condition and cough improved, and there was diminution in the daily amount of the sputum, which had become far less offensive. At the end of this time, however, the temperature rapidly rose to  $103^{\circ}\text{F}$ . after a definite rigor, incessant vomiting and headache set in, and there was incontinence of urine and faeces.

She rapidly went from bad to worse, the temperature continued to rise and remained at  $105.4^{\circ}\text{F}$ ., both pupils were very contracted, and the angles of her mouth became drawn up and the arms showed signs of rigidity; the lower limbs were flaccid, but there were no definite signs of paresis although the patella reflexes were absent.

Coma shortly supervened with Cheyne-Stokes' respiration, and lasted about twenty-four hours, during which time there was no vomiting, until death occurred with the

temperature at  $108^{\circ}$  F.

At the post-mortem examination:-

The right pleura was found to be densely adherent from apex to base, and was much thickened in the axillary region and at the apex of the lung, where it was  $\frac{1}{3}$  of an inch thick. This was secondary to an empyema, which had formed over the upper and anterior portion of the lung, and had pointed anteriorly between the first and second interspaces; the cavity measured 3 in: X 1 in: and a sinus lined by densely thickened pleura extended from it to almost the base of the lung anteriorly, but no communication with the lung could be found to explain the profuse expectoration during life (see Fig: 10 on next page).

Fig. 10.



Anterior part of upper lobe of right lung,  
 showing cavity of Empyema, and  
 markings of the three upper ribs.  
 (To illustrate Case 2)

The right lung on section showed cylindrical dilatation and inflammation of the bronchi in the lower lobe, and fibrosis of the lung substance around them (see Fig. 11 on next page).

The left lung, pleura, and heart were normal, as were also the abdominal organs.

Fig: 11.



Posterior part of the lower lobe of right  
lung showing Bronchiectasis.  
(To illustrate Case 2.)

On opening the cerebellum, an  
abscess the size of a marble (see Fig: 12)

Fig: 12.



Section through Cerebellum showing  
an abscess cavity in the middle lobe.  
(To illustrate Case 2.)

51

full of green pus, was present in the middle lobe; this had probably tracked upwards along the I<sup>st</sup>, as, on opening the brain, the posterior horn of the right lateral ventricle contained pus. Purulent meningitis was present at the base of the brain.

No other abnormality was found.

Setting aside the presence of the empyema, this case differs from the previous one in that the nervous phenomena were less marked, the course more acute, and the termination more rapid, though coma was present in both before death; also, there was marked hyperpyrexia at the last as compared with a subnormal temperature in the first case.

The septic process in the cerebellum and brain was possibly due more to embolic infection from the diseased bronchial walls than as a result of the empyema, which



was distinctly localised and had no communication with the lung.

The formation of bronchiectasis in this case probably arose from an imperfectly resolved pneumonia at the base of the right lung; another interesting point is that the patient had no further recurrence of haemoptysis while in Hospital.

Case 3.      Chronic bronchitis.  
                  Bronchiectasis.  
                  Pulmonary fibrosis and contraction.

C. a painter aged 33 years with a doubtful family history of Phthisis, had suffered for ten years from chronic bronchitis, during which time he had had influenza once and an attack of pleurisy on the left side; since this, his expectoration gradually became profuse and thick, but only latterly had he noticed that it was

offensive. His cough was severe and came on in paroxysms, and he suffered from dyspnoea after slight exertion; emaciation and night sweats were present, also cyanosis, and there was marked clubbing of the fingers and nose: the toes were unaffected.

The chest was barrel-shaped, and physical signs of chronic bronchitis and emphysema were present in both lungs. The râles at the bases of the lungs were loud and metallic in character, but no signs of a cavity could be detected, even when his tubes were fairly empty.

The heart's action was weak, and there were signs of slight dilatation of the right side of this organ.

He was in Hospital for five months and eventually died from dyspnoea and exhaustion; the physical signs in the lungs remained practically unchanged,

54

except that the percussion note revealed increasing dullness at both bases of the lungs. Incessant and distressing cough, dyspnoea, cyanosis, and gushes of most foetid expectoration, often ending in an attack of vomiting, were the prominent symptoms; during the last two months that he lived the quantity of his sputum averaged from 22 to 28 ozs: in the twenty-four hours, and on standing separated into three distinct layers typical of bronchiectasis; twice he had a definite rigor, which did not last long, and his temperature which was never high, rose to  $102^{\circ}F$  and  $103^{\circ}F$  on these occasions; he never had an attack of haemorrhage, and tubercle bacilli were never found in the sputum.

At the post-mortem examination:-

Both pleurae were found to be extensively thickened.

Marked

cylindrical bronchiectasis and pulmonary fibrosis were present in both lungs, also old scattered tubercles, situated principally at the apices and surrounded by fibrosis (Fig: 13) At the edges of the lungs there was slight emphysema.

Fig: 13.



Section through Lung showing:-

General cylindrical Bronchiectasis.

Chronic Bronchitis.

Pleuritis.

Chronic Pulmonary Tuberculosis.

(To illustrate Case 3)

The walls of most of the bronchi were in a state of inflammation, and some contained thick purulent secretion.

The other organs were unaffected by disease.

At first the patient experienced relief from taking creosote baths regularly, and his appetite and general state improved with this and an acid expectorant mixture, which acted as a tonic. A 10% solution of formalin was used in an 'Atomiser', and sprayed into the trachea with the idea of diminishing the foetus, but this did not answer very well.

Later on, when his symptoms and condition became worse and he was bed-ridden, he obtained some relief by being kept under a tent in an atmosphere of steam and creosote, and he derived most rest by lying upon his chest, which he said eased his cough; he never could empty his tubes by leaning over the bed, as this caused

him urgent dyspnoea. Before he died oxygen was used almost continually, but without any great benefit.

- Case 4. Chronic bronchitis.
- Bronchiectasis.
- Septic broncho-pneumonia.

H. a newspaper-boy aged 16 1/2 years, had suffered from a cough, which was worse in winter-time, ever since he had an attack of scarlet fever six years previously. There was no family history of Phthisis, but he said that his sister aged 18 years suffered from a bad cough and nasty smelling expectoration.

His cough had become worse lately as the result of a cold, and the quantity of expectoration had become greatly increased and was very foetid.

When first seen he was cyanosed and dyspnoeic: his respiration was

fairly rapid and his fingers, nose, and toes were blue flattened and clubbed. Cough was frequent and distressing, and the sputum which was greenish in colour and very tenacious, averaged in quantity 15 ozs: per diem, while on standing it showed typical bronchiectatic characters; tubercle bacilli were absent, but numerous elastic fibres were present in the sputum.

The Chest was of the 'rickety' type, and percussion showed patchy dullness over both lungs in front and behind; the respiratory murmur all over was of a weak bronchial type with prolongation of expiration, accompanied by creaking and coarse mucous râles and ronchi. At both bases of the lungs, but chiefly at the right, there were indefinite signs of cavity, which varied from time to time according to the amount of secretion present in the lower bronchi.

The disease ran an acute course and from the outset his condition was critical; the temperature was high and irregular, and was characteristic of a septic bronchopneumonia. Vomiting was frequent, especially after cough, and he continually complained of pain in the front and back of his head; no optic neuritis was present: the fundi were normal as was also the extent of his visual fields.

Death took place when he had been in Hospital a week, shortly after a rigor, followed by a rise in temperature to  $104.2^{\circ}\text{F}$ .

At the post-mortem examination:-

The bronchi in the right lung were dilated cylindrically in all three lobes, especially in the lower lobe, and their walls were found to be the seat of septic inflammation, while around them

was considerable fibrosis.

The upper and middle lobes of the right lung were solid from broncho-pneumonia, and near the apex of the former was a gangrenous cavity the size of a pigeon's egg (see Fig: 14).

Fig: 14.



Section through right lung showing:-

- Cylindrical Bronchiectasis.
- Gangrenous cavitation at apex.
- Broncho-pneumonia (septic)
- Marked pulmonary fibrosis.

(To illustrate Case 4)

Throughout the lung were several small communicating cavities.

The left lung showed scattered patches of broncho-pneumonia, with the formation of small gangrenous cavities, but there was no bronchiectasis.

All the other organs were natural.

In this case, scarlet fever was doubtless the predisposing cause of the chronic bronchitis and ultimate bronchiectasis, and his consequently lowered vitality, and the state of his lungs, rendered him an easy prey to an attack of broncho-pneumonia which carried him off.

Treatment during his illness resolved itself into keeping him in an atmosphere of creosote and steam, and stimulating his heart; an effervescent mixture containing four grains of carbonate of ammonia, given every four hours or oftener when necessary, relieved the vomiting

to some extent, and helped him to expectorate the tenacious material that clogged his bronchi, more readily; eventually oxygen was used continually and relieved the distressing dyspnoea.

Case 5.      Chronic bronchitis.  
                    Pleuritis.  
                    Bronchiectasis.

W. an engineer aged 37 had suffered from chronic bronchitis for six years, which had become worse since an attack of influenza two years previous, since when, he had lost flesh and sweated at night, and had had one slight attack of haemoptysis; there was a doubtful history of Phthisis in his family. His cough was very troublesome and he became dyspnoeic and sometimes cyanosed after a paroxysm: his sputum was copious and purulent, and presented

43

the features of bronchiectasis: no tubercle bacilli were present on three separate examinations of the sputum, during the time he was in Hospital.

His fingers were slightly clubbed, and he complained of a continuous dragging pain in the right side, which was dull on percussion, and where slight friction was audible on auscultation; both right and left lungs were dull on percussion at their bases, where there was marked evidence of bronchitis, no signs of cavity were present in either lung, and nothing abnormal was found on examination of the anterior aspect of the chest: the heart was normal.

This patient was in Hospital for three months and left considerably improved in health.

He increased in weight, and the cough and dyspnoea had almost gone, but the sputum remained offensive; the physical signs in the lungs had cleared up considerably, only

a few loud râles remaining at the right base. He derived much benefit from creosote baths daily, which enabled him to empty his tubes freely, and for the remainder of the day his cough and expectoration were only slight; occasionally the baths had to be discontinued for a short time owing to sickness and dyspepsia - but this did not last long.

The daily amount of his sputum decreased, and averaged 10 ozs: per diem when he left, as compared with 14 to 15 ozs per day when he came to Hospital; thrice he had slight attacks of pyrexia, which soon passed off.

This patient was probably free from Tubercle, in spite of an indefinite family history of this disease; no tubercular lesion could at any time be discovered in the lungs, and no tubercle bacilli were ever present in his sputum.

Case 6 Chronic Pulmonary Tuberculosis.  
 Thickened pleura.  
 Doubtful bronchiectasis.

W. a tailor aged 44 years had suffered from a winter cough for seven years, which started after a sudden and sharp attack of haemoptysis. There was a family history of Phthisis, and five years before he came to Hospital he had an attack of left pleurisy with effusion, and 62 ozs. of fluid were withdrawn; altogether he had had five attacks of haemoptysis. He had been losing weight and sweating at night and was troubled with a severe cough and dyspnoea; the expectoration was abundant and purulent but not particularly offensive to the smell, nor did it present typical bronchiectatic features by separating into three layers on standing. There was fairly constant pain in the left side, the fingers were not clubbed,

and the heart was normal and not displaced.

The right lung showed evidence of tubercular infiltration at its apex, of a chronic nature, and signs of bronchitis were present at the base; in the left lung, the pleura everywhere was considerably thickened: there was also doubtful consolidation of the apex and signs of bronchitis at the base: the percussion note over the whole of the left lung, especially at the side, was extremely dull; none of the physical signs at the right or left base were ever indicative of bronchial dilatation.

He was in Hospital for nearly four months and during that time had two attacks of Haemoptysis, neither of them severe. The physical signs in the chest remained practically unaltered, although his general health improved slightly and the sputum decreased in quantity.

His cough and the consequent dyspnoea

were most distressing; the cough was dry and harsh, and a paroxysm often lasted over an hour, during which he would freely expectorate thin frothy fluid, and this did not tend to diminish the paroxysm: it sometimes increased it.

Twice he had pyrexia, quickly subsiding, which was doubtless due to the tubercular lesion in his lungs: otherwise the temperature was practically normal.

Many remedies were tried for his cough, and although Hydrochlorate of Heroin gr.  $\frac{1}{25}$  every four hours often relieved it at night, an acid mixture containing belladonna, which was very well tolerated, was taken continuously, and caused some diminution in the quantity of the expectoration, which averaged in quantity 13 ozs. per day during his last two weeks, as compared with 17 ozs. per day during his first fortnight in Hospital.

Although there may have been a slight

degree of bronchial dilatation at the left base as a result of the pleurisy and chronic bronchitis, this case was by no means typical of bronchiectasis, and there was probably more pulmonary fibrosis present than bronchial dilatation.

Case 7. Bronchiectasis as a sequel to a probable Empyema.

J. a Railway clerk aged 33 years, with a good personal and family history, complained of cough, foetid expectoration and recurrent attacks of sometimes severe haemoptysis, all of which dated from an attack of pleurisy with effusion four years previously, for which he was tapped, with the result that a pint of thick yellow and blood stained fluid was withdrawn.

A few months later he had suddenly expectorated, without coughing, nearly a

put of dark and sticky material, which was offensive both in smell and taste. His cough was most troublesome on stooping down or lying on his left side: he had no dyspnoea, pain, or night sweats, but had lost flesh. His fingers were markedly clubbed and his chest badly developed and thin: the right side of the chest was, on measurement, found to be smaller than the left side.

The sputum was intensely foetid, but only averaged in quantity  $4\frac{1}{2}$  ozs. per diem; it showed on standing the three layers typical of bronchiectasis, and microscopically pus cells and streptococci were present, together with crystals of haematidin and fatty acids, and a few leptothrix spirals: there were no tubercle bacilli or elastic fibres.

On examination, the right lung gave evidence of thickened pleura at the side and base, where there were numerous harsh and fine râles most marked after coughing, and the

breath sounds were wavy ; the left lung and heart were normal.

This patient was in hospital for six weeks and improved considerably. From the various factors in his history and physical signs, it seemed as if he had had an empysema on the right side communicating with a bronchus, and that neighbouring bronchi had become dilated, owing to the strain of coughing and presence of secretion within them. He sputtered his tubes regularly three daily in the usual manner, and in addition to this had creosote baths later on, and appeared to derive much benefit thereby. He had almost lost his cough when he left, and had none when lying on the left side as he used to do : the sputum was far less offensive, but the physical signs in the right lung remained unaltered

The space occupied by the empysema had probably contracted

71

considerably, and in time should become obliterated, as there was slight compensatory falling in of the right side, but there was no doubt some bronchiectasis at the base of the right lung, which would be likely to remain, but not necessarily increase, if he kept the dilated tubes empty, took care of his general health, and avoided any exposure that might lead to an attack of bronchitis.

### Case 8. Bronchiectasis: pleural type.

F. a female aged 40 years, had suffered from severe paroxysmal cough and profuse and offensive expectoration ever since an attack of right pleurisy a year previous; she had also had six slight attacks of haemoptysis during that time.

There was marked flattening and falling in of the right side of the chest,

which was dull on percussion all over, and the breath sounds in the right lung were everywhere weak and interrupted, with loud creaking râles, especially at the base posteriorly; there were no signs of excavation.

The heart and left lung were normal. Her fingers were clubbed, also her nose slightly, and the cough and dyspnoea were distressing - occasionally there was cyanosis; the sputum contained no tubercle bacilli but was fetid and copious, separating into three layers on standing.

At first the temperature was high and irregular, but as time went on it became normal and remained so, with distinct improvement in the general condition, and a diminution in cough and the amount of sputum, which became less offensive.

Pain, which was present in the right side was greatly relieved by applications of equal parts of the tincture and liniment of iodine, and

under this treatment, and the internal administration of potassium iodide, the pleural symptoms decreased considerably.

When the temperature had subsided, creosote baths were taken every other day, and improvement began with the first one and continued, but before she was able to go to the bath, a mixture containing ether and ammonia relieved the cough and dyspnoea; latterly a simple bitter tonic was given.

She left Hospital greatly improved after three months, in spite of a little cough and slight expectoration; there was no return of haemoptysis, and the physical signs in the right lung became much diminished, although at the right base there were still signs of bronchial dilatation, which would be likely to remain always.

Bronchiectasis in this case evidently resulted from pleurisy, not necessarily tuberculous, as no tubercle bacilli were found in the sputum, but a definite cause of the pulmonary haemorrhage was obscure.

In six other cases of Bronchiectasis which I had the opportunity of watching, the physical signs in the lungs and the symptoms were all more or less similar to those which I have described more in detail in my previous cases: paroxysmal cough ending in profuse and foetid expectoration, with dyspnoea and varying degrees of cyanosis, and clubbing of the fingers and sometimes the toes, being the most marked and constant signs.

In one of these cases the onset of bronchiectasis was very sudden, following acute lobar pneumonia in one lung, which had not undergone resolution: the expectoration was considerable, and in addition to the usual characteristics, contained numerous tubercle bacilli; the patient was a man aged 30 and showed typical signs of acute pulmonary osteo-arthropathy: when last seen there was slight improvement in

his condition.

Pleurisy, causing much displacement of the heart, chronic bronchitis, chronic pulmonary tuberculosis, and whooping-cough, were exciting causes of bronchial dilatation in four of the cases, and the last had run a chronic course for 14 1/2 years, one lung being affected with general bronchiectasis, probably of the saccular type according to Dr. J. Dyke Acland, as there were well marked cavernous signs when the tubes were empty, and the foetid expectoration was usually sudden and profuse, as much as half a pint being brought up at a time.

The most chronic case of bronchiectasis that I have been able to watch during the last eight years is that of a gardener, the subject of fibroid phthisis for more than twenty years, whose sputum has been offensive and increasing in

quantity for the last five years or so, and who has had numerous small and two large attacks of haemoptysis, the last of which occurred quite recently: and it is an interesting fact to note that the sputum has been less foetid since the last haemorrhage, which seemed to considerably relieve the pulmonary congestion, although leaving him in a very weak state.

His fingers and nose are clubbed, but this sign is now not so marked as it was sixteen months ago.

Now, he is quite bedridden, and although he has experienced some relief by having the foot of his bed raised, he now prefers to remain in the kneeling posture with his head on the pillow, and this is the only way he says he can obtain any rest; this posture doubtless suggested itself to him as enabling him to allow his tubes to be continually drained.

His cough is most distressing, and he expectorates nearly two pints of foetid material in the twenty-four hours, with marked bronchiectatic characteristics.

The only drug which he has any faith in - and many have been tried - is Creasote; he takes a few drops of this on sugar every three or four hours, and this acts as a sedative to his cough. His condition is most hopeless.

This now brings me to the end of my theme, and I trust that the account I have endeavoured to give in all its various details of this disease, one presenting so many symptoms often beyond the reach of treatment, may recommend itself, and be thought worthy of perusal.