INTRATHORACIC GROWTHS

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The above heading is rather comprehensive for various growths, both benign and malignant, are to be found inside the thorax. This particular thesis, however, except for the histories of a case of malignant growth of the oesophagus in the thorax, of that of a gummae in the posterior mediastinum, and of that of an unusually large aneurism of the ascending part of the arch of the aorta, is composed entirely of material relating to malignant growths of the lungs, pleura and mediastinum.

I was, no doubt, fortunate to procure some nine or ten cases bearing on my subject within the short period of four months, for malignant disease of the lungs and mediastinum, — although it must be admitted that many cases of the kind are never diagnosed or are merely regarded as old standing pneumonias or thickened pleurae or perhaps never come under the notice of a medical man, — is rare. Thus Dr. Hill Abram, Physician to the Royal Infirmary, Liverpool, in an Article in the British Medical Journal of December 1906, records 14 cases collected during the long period of five years. Personally during the period I attended the Royal Infirmary as a student I saw exceedingly few cases of malignant
disease of the lungs and mediastinum and as I have mentioned before the cases I am about to describe only came under my notice during the last four months of the two years I have spent in a hospital as House-surgeon and House-physician.

Although daily examination of the patients revealed to me the many peculiarities in the physical signs and symptoms still to make my thesis as full as possible I have had to consult freely the works of well-known authorities on the subject, whose names I add at the end. To Dr. Lloyd Roberts, Honorary Physician at the Royal Southern Hospital under whom I worked, I am greatly indebted for valuable hints received at the bedside and for permission granted to record the cases.
I. MALIGNANT GROWTHS OF THE LUNG.

These may be primary or secondary. The lungs are rarely invaded by tumours originating in adjacent structures except when these are situated in the pleura and root of the lung. In secondary malignant disease, the breast, bronchial glands, oesophagus, stomach, liver, peritoneum, testes, ovaries and bones are the chief seats. I remember being present at the post mortem of a woman who died in an Asylum. A large secondary malignant growth was found in the root of the left lung. The primary growth was in the left ovary. It is invariably the rule to find that the lung is the place of selection for secondary growths in primary sarcomas of bones. One of my cases illustrates this.

The primary growths are chiefly carcinomas and hyposarcomas.

According to statistics primary malignant disease is rare and there seems to be a great difference of opinion as to whether primary carcinoma or primary sarcoma is the more frequent. German writers seem to think that primary carcinoma is the more frequent, whereas Drs. Rolleston and Trevor out of 3983 autopsies at St. George’s Hospital found only 3 cases of primary malignant disease of the lung and these were
sarcomas, and they seem to think that all primary disease of the lungs is sarcomatous, and are spindle-celled when arising in the body of the lung, and endotheliomatous when arising in the root. So-called primary carcinoma of the lung arises either from a bronchus and contains ciliated epithelium or from the epithelium of the alveoli and general belief is that the last named view is the more probable.

Males are more commonly affected and as regards age it is not uncommon to find malignant growths of the lung in persons under 20 years of age. (Horn illustrates 3 cases under 20 years of age). My own cases were all over 30.

Metastasis is rare in sarcomas and often entirely absent but in carcinoma may be widespread. In one of my cases metastases were found in the bronchial and mediastinal glands, liver, pleura, kidneys, spleen, cervical glands, axillary glands, diaphragm, skin, peritoneum, pericardium and heart muscles.

Pathological Anatomy: The disease may take the form of infiltrations, distinct tumours or a combination of both. Primary malignant disease is not infrequently confined to a single lung, whereas secondary growths as a rule affect both lungs, and generally assume a nodular form being specially abundant near the periphery, whilst the
infiltrating variety is in the majority of cases primary.

When of the tumour form, there may be but one growth of large size which generally extends from the root into the central portion, or the growths may be multiple and scattered, varying in size from an almond to a good sized apple - nodular form. These growths may coalesce and the lung becomes converted into a mass of growth.

The disease may also present a miliary appearance - miliary carcinomatosis - and resemble tuberculosis, but it differs from that disease in that the apices are not specially implicated and may be quite free. Whether it is possible for both diseases to occur together I am not prepared to say.

When of the infiltrating form according to Wilson Fox there may be either, a general infiltration of the pulmonary tissue itself, the condition closely resembling the grey pneumonia attending tuberculization, or the infiltration may proceed in the course of the interlobular septa from which the growth may extend directly into the pulmonary tissue or along the bronchi and blood vessels.

When malignant disease affects a lung, that organ as a rule undergoes a change. The lung either increases or diminishes in size, but it may remain normal in size. I have seen cases illustrating all
three. Enlargement is usually associated with single or disseminated growths or where there is an incorporation of these. Infiltration as a rule produces contraction. The lung feels heavy and the weight is increased. According to Stevens the pulmonary tissue not actually involved becomes congested and compressed, or may remain normal, but more often than not inflammation and even suppuration may set up around cancerous masses.

In only one of my cases did I find numerous infarctions studded around the cancerous growths. All distinction of lung structure ultimately tends to disappear as the spread of the disease advances, the vessels and bronchi resisting the longest, and the lymphatic vessels round the growths may become distended with growth.

The growths themselves may undergo secondary changes, e.g. necrosis and softening forming abscesses and cavities. In one case before the diagnosis of malignant growth was made, we thought that the patient was suffering from localised empyema, for when exploring a dull patch at the side of the scapula with a needle, yellowish white material resembling pus was withdrawn. At the necropsy it turned out that the needle had merely entered a localized tumour which had undergone necrosis and softening, the yellowish material being the softened
tumour contents. The lung in fact may become converted into one big cavity (Rolleston.)

Haemorrhages into growths are not uncommon and when the pleura becomes involved in a growth, extensive pleuritic adhesions are often observed, or which is more common, there is haemorrhagic effusion into the pleural cavity. The unaffected portions of lungs are as a rule collapsed or gangrenous.

Symptoms and Physical signs:— Before enumerating the various symptoms and physical signs which one may come across in malignant disease of the lung it may be as well to take into consideration certain points, viz:—

That small isolated or deep-seated pulmonary growths need not necessarily be associated with any symptoms or physical signs.

That in some cases although the symptoms may be none or very slight, physical signs leave no doubt as to the existence of a growth.

That when the disease develops on an extensive scale in one or both lungs it will probably give rise to more or less pronounced pulmonary symptoms and physical signs and various pulmonary affections may be simulated.

That should the growth be confined to the lung only, intrathoracic pressure symptoms may be altogether
absent, unless the growth in its course encroaches on the mediastinum, when the pressure phenomena of mediastinal tumour will be recognized.

Symptoms:— Pain may be entirely absent but when present usually comes on in the later stages of the disease, is localized, and of a stabbing nature, and may be accompanied by superficial hyperaesthesia. In one of my cases where the right lung was almost riddled with secondary growths, the patient during his illness was practically free from pain and merely complained of a feeling of discomfort.

Dyspnoea is generally present and its nature and degree will depend chiefly on the extent to which the lungs are implicated and their functions interfered with. In one of my cases there was shortness of breath and the respirations were hurried even while the patient was at rest. At times she used to get exceedingly severe attacks of spasmodic dyspnoea and would be in great distress.

Cough was present in the majority of my cases and sometimes was very distressing, and generally hard and dry.

As regards the sputum, there was nothing peculiar about it in any of my cases. In the majority of them it resembled that of bronchitis and was purulent in two. The so-called red-currant jelly sputum which some writers lay great stress on and
they are no doubt justified in doing so, I never saw and I should say to get it is rare. I should therefore say that unless malignant cells are found in the sputum, (and there are cases on record where this has happened) very little importance can be placed on the naked eye characters of the sputum. Haemoptysis according to Walshe is important and may be the earliest symptom, and he has found it in 77% of his cases of malignant growths. In one of the cases I record it was a prominent symptom and at first I mistook the case for phthisis pulmonalis, but that it is malignant I have now no doubt whatsoever.

Enlargement of superficial veins with oedema may supervene during the progress of a growth originally pulmonary and possibly dysphagia but not so long as the growth is limited to the lung. I shall have a good deal to say on this symptom in mediastinal growths.

Patients afflicted with malignant disease of the lungs are more or less cyanotic as a result of interference with the respiratory function and a look of anxiety is very noticeable. Dr. Williams one of the past honorary physicians at the Royal Southern Hospital, Liverpool, used to say that he could diagnose malignant disease of the lung in a patient by merely looking at him or her. Such an
expression I should say is rather far-fetched. Loss of weight may be rapid, but one fact that struck me forcibly was this, that the cachexia, generally so well marked in cases of abdominal malignant disease, is exceedingly slight in cases of pulmonary malignant disease. In fact in one of my cases it was entirely absent. The patient generally complains of extreme weakness. Albuminuria may be present. The temperature as a rule is normal, but Rolleston has had fever reaching to $103^\circ$ F. in some of his cases. In all my cases there was a definite leucocytosis.

**Physical Signs.** The clinical phenomena when present naturally show much variation according to the seat and distribution, number, extent and size of the growths, also secondary effects, associated conditions &c. Thus to give definite comprehensive descriptions of the abnormal physical signs is by no means an easy task.

**Changes in the Chest.** The chest may show unilateral enlargement owing to extensive implication of one lung, the intercostal spaces being flattened and widened, or there may be uniform enlargement even if one lung only be affected, compensation of the healthy lung distending the healthy side; or should the affected lung be retracted or collapsed, there will be retraction of the affected side with
depression and narrowing of the spaces, the healthy side being distended, and also it is quite conceivable that a large circumscribed growth may cause a localized bulging of the chest wall.

**Respiratory Movements.** The most striking disorder is deficiency or abolition of expansion during inspiration and this is generally due to the growth itself, but may be partly the result of obstruction of a bronchus. Should extensive areas of either one or both lungs be affected, unilateral or bilateral retraction respectively may be noticed.

**Tactile sensation.** When the hand is laid on the chest wall, it meets with a sensation of firmness and resistance which is very characteristic especially when the growth is near the surface. Vocal fremitus, where the growths are diffused, but there is no actual interference with the lumens of the bronchial tubes, will be increased and often so in patches, but when the growth encroaches on the bronchial tubes and these become partially or wholly obliterated, the vocal fremitus will be diminished or absent as the case may be. The absence of vocal fremitus with a resonant note over the lung, according to Lloyd Roberts and Hill Abram, is one of the earliest and best signs of pressure on a bronchus and from experience I fully endorse their statement.
**Percussion.** Dulness is the usual percussion sign one would expect and may range from mere impairment of resonance up to absolute dulness. In cases where growths are scattered about in the lung it is sometimes possible by careful percussion to isolate patches of healthy lung. When percussing over a growth the sensation of resistance to the finger is very characteristic. Should a main bronchus be blocked the affected side may give a hyperresonant note. The healthy lung as a rule gives a compensatory hyperresonant note. Should a growth be limited to the lower lobe and through implication of the pleura, an effusion be thrown out, the lower half would give the dull note, a high pitched and sometimes a skodiac note may be yielded in the infraclavicular region.

**Auscultation.** The breath-sounds vary markedly. In cases where the growth is in the form of diffuse miliary nodules, the breath-sounds will be harsh. Should the lung become converted into a solid mass or the main bronchus blocked by growth, the breath-sounds will be practically inaudible. It is sometimes possible to locate breath-sounds in patches which correspond to healthy lung tissue, just below the scapula tubular breathing can sometimes be heard. In one of my cases this was present on some days and not on others. Pleural ef-
fusions will naturally help to weaken the breath-sounds very materially. In cases where a mass of growth surrounds a bronchial tube, but does not obliterate it, the breath-sounds are generally bronchial or tubular in character. Where cavities have formed the breath sounds will be cavernous in character. The opposite lung, if healthy, generally gives a puerile sound.

Adventitious sounds, such as rales and crepitations are audible when secondary pneumonic changes take place. When the lung tissue is in a state of partial consolidation but bronchial tubes patent, the vocal resonance will be increased and may be pectoriloquious and even oegophonic, but when the growth encroaches in the lumens of the bronchial tubes or fluid is present in the pleural cavity, it will be impaired or entirely suppressed.

Lastly, displacement of the heart may take place and may be considerable when effusion is superadded.

**Course.** Malignant disease is chronic in its course and progressive. Death may come within 6 months or the patient may linger on for a few years. According to Wilson Fox "the ordinary course of growths limited to lungs is that of a gradual death by means of mingled conditions of asphyxia, hectic and exhaustion in relatively varying degrees in
which, however, asphyxial symptoms usually predominate being sometimes rapidly intensified by the supervention of acute oedema of the lungs.

**Diagnosis.** As malignant disease of the lungs may be simulated by other pulmonary conditions it is essential to differentiate between it and such other conditions.

**Acute pulmonary diseases.** These are represented by bronchitis, pneumonia, phthisis or acute tuberculosis. Special reference is made by Wilson Fox to acute caceous pneumonia affecting chiefly the base and consolidating the whole or greater part of the lung, as in some cases presenting a striking resemblance to infiltrating cancer when the latter does not retract the side. The most distinctive features are the high fever, the more abundant expectoration and the rapid emaciation. Diarrhoea, if present, would be still more in favour of caceous pneumonia.

**Chronic pneumonia.** Fibroid lung is likely to be confounded with the infiltrating variety of pulmonary cancer which causes retraction of the side. There will, however, be a difference in the histories of the two conditions. The difference in physical signs would be of help. Absolute dulness with marked resistance weakness or suppression of breathsounds, the absence of adventitious sounds and
abolition of vocal-fremitus and vocal-resonance, would be in favour of malignant disease. In fibrotic lung there is most likely to be cavities or dilated bronchi and tubular breathing with moist or consonant rales are likely to be audible.

**Chronic Pulmonary Tuberculosis.** This is a condition for which malignant disease may easily be mistaken, especially when the latter involves the upper part of the lung, breaks down and forms cavities. The characteristic physical signs of a vomica may be present together with general wasting and even pyrexia. Implication of both apices with absence of any pressure symptoms would be in favour of tubercular mischief, whereas extensive consolidation of one lung without any signs of softening or cavities but with diminution of breath sounds, and perhaps extension of dulness across the middle line towards the healthy side, would point to malignant disease. A more or less continual normal temperature is also very suggestive. Hæmoptysis points as much towards malignant disease as it does to tubercular mischief. This is pointed out in one of my cases. When it occurs in malignant disease it is apt to be very frequent, whereas in phthisis it may not recur for some considerable time and is curable. Should the glands above the clavicle be enlarged, it would be in
favour of malignant disease. The sputum should of course be examined frequently. Presence of tubercle bacilli would of course be conclusive of phthisis, pieces of growth of that of malignant disease, whereas the absence of either would be more in favour of new growth than of phthisis.

**Affections of the pleura.** An adherent and much thickened pleura might be diagnosed when the condition is really malignant, but of more importance is the danger of mistaking a malignant tumour of the lung which is so extensive as to occupy the whole of one side of the chest, for a chronic pleurisy with effusion or empyema, and often it is only after having carefully watched the progress of the disease and made careful examination that a definite decision can be made. I remember in one of my cases, but for the fact that the man had been operated on six months previously for sarcoma of the lower jaw, it would have been exceedingly difficult to say which condition he was really suffering from, for he had no cachexia, no currant jelly sputum and the physical signs were all those of extensive pleuritic effusion. This man's lung turned out to be a mass of secondary growths with effusion. The presence of blood-stained sputum and enlarged glands above the clavicles would of course help to clear up the diagnosis. In discussing pleuritic affec-
tions and malignant disease, Rolleston adds the following:

Oedema of the subcutaneous tissue of the chest is suggestive of intrathoracic tumour though it does rarely occur in connection with empyema. In the latter case however it is almost always unilateral and the superficial veins are not enlarged. When the oedema is more extensive over the thorax, involving also the neck, face or arms and accompanied with any appearance of cyanosis, or with dilated veins the diagnosis is strongly in favour of growth.

The affected side is more or less enlarged as a whole in both kinds of cases, but extreme enlargement would be rather indicative of pleural effusion, in which condition the dilatation is likely to be uniform. Any want of regularity or a local bulging, would suggest a tumour. Emphyema, however, may cause a limited prominence. Also fluid tends to make the intercostal spaces prominent, whereas a growth will tend to stretching without protrusion.

A feeling of fluctuation, he says, over any of the intercostal spaces is in favour of empyema, whereas a pulmonary growth may yield a remarkable degree of resistance on palpation which is very suggestive.

As regards percussion, dulness is prominent in both cases, but in favour of tumour are extension of
dulness from above downwards, or it may be less marked below than above, irregularity and inequality in the degree of dulness in different parts of the chest, possibly with resonant spots, not varying with change of posture and its irregular extension across the middle line at the upper part of the thorax. Absence of skodaic resonance under the clavicle, he says, is significant of growth. No doubt it is, but as I have stated before, it was present in one of my cases of malignant growth.

Both in pleural effusion and malignant growth the breath sounds and vocal resonance may be practically abolished, but in the latter case they will probably be audible over some spots at any rate and there may be bronchial breathing and bronchophony over considerable areas where dulness is pronounced.

Displacement of the heart is likely to be more marked in cases of pleural effusion than of tumour, which has rather a tendency to push the heart more downwards than laterally, especially when the left side is affected.

An exploratory puncture should always be made and may clear up doubtful cases, but it must be remembered that either clear or purulent effusion may be but symptoms of underlying malignant disease.

**Prognosis.** This is quite hopeless.
II. MALIGNANT GROWTH OF THE PLEURA.

As regards physical signs practically everything has been said about this condition in discussing the differential diagnosis of malignant growth of the lung and pleuritic affection and therefore little remains to be said. The case I illustrate came in as one of chronic pleurisy with effusion and as such he was treated until the rapid accumulation of fluid, which at first clear soon became blood-stained, made us rather suspicious. Also, about 6 weeks after the first tapping a small nodule appeared at the seat of puncture and this nodule being examined microscopically, it was found to be malignant. There was then no further doubt as to the condition, but whether it was secondary to lung cancer we could not say at the time.

When there is no cachexia, little or no pain and the physical signs purely and simply those of chronic pleuritic conditions, often a combination of fluid and thick adhesions, the difficulty is understood, and it may be a long time before the real nature of the condition is brought to light. In malignant disease the onset as a rule is insidious and attention is first attracted by dyspnoea due to a large effusion. Rapid accumulation of fluid after tapping, whether the fluid be haemorrhagic or
not, is very suspicious of malignant growth, in fact in some cases it may be the only thing to go by.
Should the patient live sufficiently long, the growth may spread outwards into the subcutaneous tissues and skin of the chest wall, which would be conclusive.

Morbid Anatomy. The most common form of primary malignant disease is the endothelioma arising either from the endothelium of the lymphatics or from the surface endothelium of the pleura. The microscopical structure of the growth is described on another page where I show a section. The pleura may become very much thickened. The growth according to some writers spreads directly by the lymphatics to bronchial glands and other adjacent serous membranes such as the capsule of the liver, peritoneum and omentum &c.

Secondary malignant disease of the pleura is more common. Thus in scirrhus of the breast by direct lymphatic spread. To the naked eye the growth may affect the pleura in the following ways:-

(a) There may be a uniform infiltration of the pleura, thickening that membrane to a considerable extent, the parietal pleura chiefly being affected.

(b) Or enormous masses of growth may project from the surface into the pleural sac and become pedunculated.
In one of my cases where the pleura was affected secondarily, the diaphragmatic pleura was covered with tuberculous growths, the condition of the costal pleura being similar.

III. MALIGNANT GROWTHS OF THE MEDIASTINUM.

Malignant disease of the mediastinal tissues is a not uncommon accompaniment of malignant disease of the lungs. In fact in all the cases I record on which postmortems were made with the exception of one, the mediastinum was involved to a considerable extent. I feel, therefore, that I am fully justified in writing a separate article on the clinical aspect of mediastinal malignant growths. To describe the condition very fully would necessarily mean a repetition of a good deal of what has been said in connection with malignant disease of the lung, and I shall therefore endeavour to restrict myself as far as possible to what is peculiar, especially as regards physical signs and symptoms, to mediastinal growths alone.

Varieties of malignant growths considered.

(I) Carcinoma, (II) Sarcoma and Lymphosarcoma.

I am unable to say whether carcinomatous or sarcomatous are the most frequent. Powell and Lindsay Stevens assert carcinomas both primary and
secondary are rare and when they do arise are found chiefly in the posterior mediastinum. Hare, on the other hand, asserts that cancer is more frequent than sarcomas and goes the length of saying that the tissues in which cancer may arise in the mediastinum are numerous, those that it does not attack can scarcely be mentioned. Personally I would agree with Powell and Stevens for all the cases I have seen post mortems on, were of the sarcomatous type. According to Roberts, carcinoma as a secondary condition is extremely rare as metastases. The mediastinum may be encroached upon by a cancerous growth starting in the lung and pleura as well as other adjacent structures or cancer of the breast may extend through and invade the mediastinum. Primary cancerous growths arise chiefly from the epithelium of the trachea, bronchi and oesophagus.

As regards sarcomatous the ordinary round- and spindle-called sarcomas are met with. Lympho-sarcomas are the most frequent and chiefly primary (Powell). These growths start in the glands met in the mediastinum, viz. the bronchial and anterior mediastinal. Many writers look upon lympho-sarcomas and lymphadenomatous tumours as identical, the latter being more rapid in their growth. In secondary sarcomas the primary growths are usually in the pleura, abdominal viscera, limbs and in bones. As regards
the etiology of these growths little is known. Continued pressure on the chest by foreign bodies and hereditary proclivities are probable factors.

According to Hare, males are chiefly affected and although adults are more liable to develop these growths, children even under five are not exempted.

**Morbid Anatomy.** Opinion seems to be divided as to whether the anterior or posterior mediastinum is the most common seat for primary cancer. Hare and Wilson Fox think that the anterior mediastinum is chiefly affected by primary cancer, the posterior mediastinum being the next commonest. Steven on the other hand reversed the condition of affairs, both as regards primary cancer and sarcoma.

The tumours may be multiple and small or large usually irregular and lobulated, or in the form of diffuse infiltrations. These tumours may undergo degeneration and haemorrhages may take place into their substance. They may extend up into the neck or downwards into the abdomen. Lymphosarcomas are often of large size, irregular and lobulated, and firm to the touch. May be adherent to surrounding structures. When cut into the consistence is soft and friable and a white creamy juice escapes.

Various effects are produced on neighbouring structures by the presence of these growths. Carcinomas on their growths infiltrate and cause ulcerat-
tion of everything they come in contact with. Thus they cause ulceration and perforation of tubes and vessels, sever nerves, erode bones and produce other destructive effects. Sarcomas tumours especially the lymphosarcomas effect damage in a different way. They grow around the great tubular and vascular structures of the upper portion of the thoracic cavity without actually implicating them. I have seen the aortic arch and the vessels springing from it, entirely enveloped by a lymphosarcoma with apparently little effect on the blood stream. Nerve trunks too run through these growths and are not affected. Both the vessels and nerves can easily be separated from the growth. The veins however suffer most being easily compressed and sometimes perforated by them. The trachea may become compressed to a mere fissure, or the obstruction may be at the bifurcation. One of the main bronchi may become entirely obliterated. If the growth originates at the root of the lung, the main bronchus may be penetrated. An example of this I saw the lung having become entirely collapsed. This compression on the bronchus will produce several effects in the lung itself. Thus bronchiectasis may follow congestion, oedema and sometimes haemorrhage may set in owing to pressure on the veins. The inflammatory changes may lead to gangrene. The secretion not having a chance to escape will be-
come thick and purulent and may give rise to abscesses. In the pleural cavity effusion is very likely to take place due either to pressure on the pulmonary or vena azygos veins or from inflammation. The effusion may be clear or haemorrhagic. The pericardium is often invaded by the growth giving rise to haemorrhagic pericarditis. Even the cardiac muscle may become affected. The heart is often displaced. Mention has already been made of pressure on the aorta. In the case I mentioned although the wall of the aorta was not actually invaded, still the inner coat was greatly discolored, being very dark. Of the veins chiefly affected, there are the superior vena cava, inferior vena cava, and the vena azygos. Hardly enough stress by writers is laid on the effect of pressure on these veins, especially the azygos veins. Lloyd-Roberts in the Lancet of November 1903 describing a case of mediastino-pericarditis in a boy aged five lays great stress on the effects of venous obstruction as a useful point in the diagnosis of mediastinal tumour. The effect of obstruction to the azygos veins is oedema of the lower part of the chest and abdominal wall and such oedema is much greater in proportion to the amount of ascites than is usual in the cases of valvular disease.

The nerves usually affected are the vagus, recurrent laryngeal and phrenic. The oesophagus is
often compressed and may even be penetrated. It may be the starting point of a mediastinal tumour. Pressure on the thoracic duct may occur setting up Chylous ascites. Bones in the vicinity may be affected, such as the sternum, ribs and vertebral column. The latter may be eroded causing pressure on spinal cord.

**Symptoms and Physical signs.** As in the case of malignant disease of the lung, so here it is extremely difficult to give a comprehensive description of the clinical phenomena of these mediastinal growths. In some cases it must be remembered the growth may be small and attract very little attention, by the fact that it does not interfere with the functions of any of the important structures in the mediastinum. Some of the tumours on the other hand may be very large and give rise to pronounced physical signs and symptoms. In others again the real nature of the condition may be entirely masked by its sequelae.

**Local Symptoms.**

**Pain.** It is practically always present and may be the first symptom. It varies in its character and site. Frequently it is of a lancinating nature and may be extremely intense, and is more or less always described as shooting towards the shoulder blades from the front of the chest. In cases where the intercostal or brachial nerves are
involved there will be pain in the chest wall or in the arm as the case may be. In one of my patients pain was replaced by a mere feeling of oppression and uneasiness, the unfortunate man often telling me that he felt as if he was choking.

Dyspnoea. The respiratory disorders are amongst the most common and prominent symptoms in mediastinal tumour. Dyspnoea may be the first thing to attract a patient's attention and indicate that something is amiss. At first slight it may, as the condition progresses, become exceedingly severe and sometimes amount to partial suffocation. The slightest exertion may cause intense distress. In one of my cases the patient became subject to asthmatic attacks during one of which she ultimately succumbed. This according to Roberts is due to interference with the mediastinal nerves by the tumour. Further there will be other significant symptoms indicating obstruction to the trachea or bronchi or implication of the vagus or inferior laryngeal nerves. Thus noisy or stridulous breathing which can often be heard as you enter the ward, will be present. Interference with the nerves will give rise at first to a spasmodic and later on perhaps to a paralytic muscular disturbance affecting the glottis causing dyspnoea. The patient will present a more or less cyanosed aspect but how far this is due to the inter-
ference with respiration alone since venous obstruction will in all probability be present, is difficult to say.

Cough. This is practically always present and like dyspnoea may come on very early, become more and more severe as the case progresses. As a rule it is extremely irritable, stridulous and wheezy showing that the tracheal calibre is diminished. Somewhere, or it may be spasmodic indicating laryngeal paralysis or of a croupy quality or hoarse and husky being sometimes hardly audible. The dry and irritable cough is considered by Roberts to be very suggestive.

The sputum may be mucoid or mucopurulent. Its examination affords little help. Occasionally it may be streaked with blood but after a violent coughing bout, this is more or less what may be expected.

Haemoptysis. When the growth invades the lung profuse haemorrhage may occur. I had a good illustration of this when acting as locum tenens not long ago. The patient had severe haemoptysis which extended on and off for over three weeks. His condition was supposed to be that of fibroid phthisis but the physical signs clearly indicated a growth pressing on the root of the lung. His sputum although examined on several occasions for tubercle bacilli, never gave a positive result.
Alteration in voice. This is almost sure to be present and may arise from a two-fold cause, namely pressure on the trachea and paralysis of the vocal cords owing to laryngeal nerve implication. Tracheal pressure will cause hoarseness, whereas hoarseness and weakness of the voice culminating in aphonia are chiefly associated with paralysis of vocal cords.

Cardiac symptoms. There was little to be noticed in any of my cases beyond occasional attacks of palpitation and angina due no doubt to implication of the pericardium and heart muscle and pericardial effusion. In cases where undue pressure is exerted on any of the vessels springing from the aortic arch the pulse may become irregular and slow.

Symptoms due to venous obstruction. These are of great importance, as I have mentioned in a former paragraph, in the diagnosis of a mediastinal tumour and may sometimes indicate its situation. Pressure on the superior vena cavae will give rise to swelling of the face, neck and upper extremities and distension and tortuosity of the superficial veins in those regions. The condition may of course be unilateral. Swelling of the lower extremities, ascites, distension of the abdominal veins will arise from pressure on the inferior vena cava and the important effects of pressure on azygos veins, as I have
already mentioned, are anasarca of the lower part of the chest and abdominal walls and dilatation of the intercostal and superficial veins near the spine.

**Nerve symptoms.** Implication of the brachial plexus will give rise to pain in the arm. Pupillary symptoms will result from pressure on the sympathetic, spinal pain and even paraplegia may result from pressure on the cord should the spinal column become eroded.

As regards **general symptoms**, wasting may be very rapid, and is no doubt chiefly due to obstruction to the cesophagus and pressure on the thoracic duct. The cachexia so well marked in abdominal malignant disease may be only slight or not present at all, but the patient may become extremely anaemic and pasty-looking. Sleeplessness I have noticed is a common complaint. The temperature as a rule remains more or less normal, but before death may suddenly go up. One of my patients exhibited excellent finger clubbing.

**Physical and General signs.**

**Physical examination of the chest.** Note the superficial distended veins due to venous obstruction which have already been mentioned. Also observe whether the superficial lymphatic glands are implicated. Examine both supraclavicular areas for in
mediastinal cases direct extension may occur to either supraclavicular area, but in abdominal cases the gland must be sought in the left one, as stated by Trosier many years ago. Further the thoracic wall may have become involved by the growth spreading outward, and the growth may show itself either in the sternoclavicular joint, or where the lung also is affected it may show in the intercostal spaces.

Changes in the size and shape of chest may be affected very similar to those in cases of malignant growth of the lung and will therefore not require repetition. I shall only mention a definite bulging or local prominence which may be noticed in front involving the upper part of the sternum.

The movements of the chest during respiration will be more or less and is sometimes markedly affected. Should the tumour press down on the trachea to such an extent as to cause diminished air entry, the chest as a whole will fail to rise to any appreciable extent during inspiration. If one main bronchus only is pressed on the corresponding side alone will exhibit diminished movements, the healthy side showing excessive movement. The breathing in some cases may be entirely abdominal. When the hand is laid on the chest wall over the tumour and should this reach the chest wall, abnormal firmness and resistance will be experienced. The vocal
Fremitus will be impaired or abolished.

**Percussion.** Should the tumour be small there may be no alteration in the percussion sound. The usual percussion note however when a mediastinal growth is present is more or less pronounced dulness or flatness, especially so when the tumour comes to the surface. Should the growth extend into the lung and the pleura become involved the dulness also will extend and the many changes met with I have already described under cancer of the lung. In cases where a mediastinal tumour partially obliterates a main bronchus, the lung being quite free from growth, a tympanitic note will be heard over the corresponding lung. The sensation felt on percussion is generally one of intense resistance and hardness which is extremely characteristic.

**Auscultation.** The respiratory sounds may not necessarily be affected, even although other signs may be definite. What one necessarily would expect from the pressure on the trachea or main bronchus would be diminished air entry either over both sides or over one, according as to which is pressed on, and as the obstruction gets more and more complete the breath sounds may entirely disappear. The breathing over a growth of not too large a size may be bronchial or even tubular. Adventitious sounds as described under cancer of lung
will be heard should secondary changes take place in that organ. Vocal resonance as a rule diminished or entirely abolished when the growth increases in size or where the main bronchus is completely obliterated. In exceptional cases where the breath sounds are conducted directly from a bronchus through a tumour the vocal resonance may be intense and of aegophonic character.

**Cardiac signs.** The impulse of the heart is often indistinct and the apex beat indefinite by the fact that the growth pushes the heart backwards. Lateral displacement is common.

**Special examinations.** In every case where a mediastinal tumour is suspected special examination should be carried out. Thus the sputum should be examined, but may afford little information. An exploratory puncture should be made. From the resistance the needle may meet with you may suspect something - a solid mass. If fluid drawn, it may be haemorrhagic.

A laryngoscopic examination should also be made. It may disclose paralysis of the vocal cords. Even stenosis of the trachea may be seen. Should there be intense dyspnoea and huskiness of the voice, by examination of the throat you may be able to tell whether the extent of the paralysis of the vocal cords can alone account for so much dys-
pnoea and aphonia or whether something deeper down has a greater influence in causing them. According to Permewan of Liverpool, 90% of cases suffering from paralysis of the vocal cords are due to aortic aneurism, and he only attributes 10% to mediastinal tumour.

**Course and Termination.** The condition is chronic and progressive. The patient may last for from two to twelve months. Some cases are acute throughout and terminate more quickly than others. The end generally comes from progressive weakness and exhaustion, starvation or from extensive haemophtysis, or the patient may die during a severe attack of asthma. Syncope owing to the heart and cardiac nervous mechanism being interfered with may be another cause of death.

**Diagnosis.** This may present several difficulties, and the utmost care is required in dealing with the cases. Some patients may come complaining of swollen ankles. You examine their hearts and urine and find fault with neither. Examination of the chest may reveal nothing and all you are left with is that there is obstruction to the circulation somewhere within the thorax. Such a case should be kept under observation and sooner or later definite symptoms relating to mediastinal tumour may reveal themselves. Others again there are in which the
clinical phenomena and course resemble those of some of the more common pulmonary conditions and the real underlying mischief is never suspected. A chest case with unusual symptoms and physical signs should always be suspected. When a patient tells you that he or she has had an operation done for malignant disease some time ago and now they are continually troubled with their chest and you have outside evidences of mediastinal growth, suspect mediastinal malignant growth. Some cases, of course, come with most of the typical symptoms and physical signs and with these there is no difficulty.

**Differential diagnosis.**

(1) **Various pulmonary and pleuritic affections**

A good deal of what has been said in the differential diagnosis of pulmonary growths and the various ordinary lung and pleuritic conditions will apply to these and it would be unnecessary to say anymore. It may be well to remember that the ordinary lung diseases do not give rise to pressure symptoms or may do so under very exceptional circumstances and this fact will often save a good deal of trouble. I shall therefore devote attention to the other important conditions which are more likely to cause confusion.

(II) **Pericardial effusion.** Should a pericardial effusion cause pressure symptoms as it may
do, it could easily be mistaken for a mediastinal tumour. Moreover it may be associated with a mediastinal tumour and the condition would be very confusing. As regards physical signs, the diagnosis between pericardial effusion and mediastinal growth would be founded chiefly on the situation, shape and outline of the dulness, the position of the impulse of the heart, and the effects of change of posture upon these signs. (Roberts).

(III) Mediastinal abscess. This may cause trouble especially when giving rise to pressure symptoms. However take into consideration the history of the case, evidences of local inflammation or suppuration, general symptoms indicative of pyrexia and the progress of events.

(IV) A Tertiary Gumma in the mediastinum may sometimes give rise to very definite pressure symptoms and when the patient is first seen it may give rise to great difficulty in the diagnosis. Here again the history is of great importance. Put the patient on Potassium Iodide and if it is a gumma, you will probably find that after a course of treatment extending over a few weeks the pressure symptoms begin to disappear. I illustrate one of these cases.

(V) Aortic Aneurysm. Of all the diseases which make the diagnosis of mediastinal growth dif-

36.
difficult, this is the most important. An aneurysm of considerable size may simulate a mediastinal malignant growth so closely (or vice versa) that it may be impossible, judging from the symptoms and physical signs, to say whether you are dealing with a malignant growth or an aneurysm. Both may give rise to identical pressure symptoms; and it must not be forgotten that a pulsating malignant growth although rare, is sometimes met with.

Certain points would help to guide us in the proper direction in the diagnosis and these I will now consider.

(a) Age and Sex. If the patient is young and a female, it is most likely to be a growth. If an adult man you would suspect an aneurysm. In very old people you would think of malignant growth and also in those where there is a history of malignant disease in their families or where there are evidences of malignant disease in other parts of their bodies.

Strenuous occupations favour aneurysm and so does specific infection and thus to quote the words of a famous Edinburgh physician—"Soldiering suggests syphilis, and syphilis suggests an aneurysm."

(b) Symptoms. Pressure phenomena demand special attention. Severe pain, especially in the back and radiating to the neck and down the arms sug-
gests aneurysm. You may have characteristic anginal pains and those peculiar pains due to erosion of bone are also more frequent in aneurysm.

Blood stained sputum (red currant jelly expectoration) and frequent haemoptysis would point to malignant growth. According to Powell the pressure symptoms in malignant growth are less variable than those of aneurysm and also they intend to increase as the case progresses. Steven says—"In aneurysm we can often demonstrate only one pressure effect, e.g. recurrent laryngeal nerve pressure—whereas in solid growths we often have a large number viz:- localised oedema, varicosity, dyspnoea, obstructed bronchi, hoarseness, etc. in one and the same case."

According to Lloyd Roberts of Liverpool dilatation of the superficial veins in the chest and arms and neck in the case of a suspected intrathoracic growth, invariably points to malignant disease, for the veins in aneurysm although pressed upon, are not likely to be crushed against resistant points, and so the blood still circulates through them. Interference with the air passages too is more suggestive of malignant tumour than of aneurysm (Stevens). A more or less irregular temperature, anaemia and marked constitutional disturbance are in favour of growth.

(c) Physical signs. The pulsation met with
in connection with a mediastinal tumour is not so expansive and heaving and the site of its maximum intensity does not correspond so closely as in aneurism with that of the most marked dulness. (Roberts). Limitation of the signs to the region of the arch of the aorta, marked local bulging, the presence of a thrill, accentuation of the second sound, a marked systolic murmur over the prominence of the tumour, cardiac enlargement, inequality of the pulses on the two sides or retardation in the pulsation of the distant arteries and tracheal tugging are all signs which will point to aneurysm. As I have said before, paralysis of the vocal cords is more likely to be in favour of aneurysm than of malignant growth. X-rays may be of value as indicating a pulsating tumour in aneurysm and merely an undefined shadow in malignant growth, but its usefulness cannot be relied upon.

When you have come to the conclusion that you are dealing with a mediastinal malignant growth and not an aneurysm it may be as well to decide whether the growth is carcinomatous or sarcomatous. When these growths are secondary to growths elsewhere the matter will be fairly easy, e.g. primary scirrhous of the breast, primary cancer, disease of the stomach, primary sarcoma of any of the bones. Their metastases will be of a similar nature.
If however the growths are primary in the mediastinum the matter is more difficult. Lymphosarcomas as a rule are bulky tumours often giving rise to very definite physical signs and pressure symptoms, whereas primary cancers of the mediastinum are as a rule small and often incapable of giving rise to physical signs capable of detection.

**Prognosis.** Hopeless.

**Treatment.** I shall here include that of malignant growth of the lung and pleura as well. In all three instances the treatment can be merely palliative. Put the patient in that posture which affords most relief. Pain should be relieved by hypodermic injections of morphia. Leeches or venalectomy may sometimes afford relief. Tracheotomy may have to be done for the relief of paroxysmal dyspnoea from laryngeal spasm. When much effusion draw it off. This will sometimes afford comfort. Attend to general health and keep up the strength of the heart by means of cardiac tonics.

This concludes what I have to say on the subject of Intrathoracic growths restricting myself to malignant growths of the lung, pleura, and mediastinum. In my introductory remarks I made mention of a case of malignant growth of the oesophagus and of that of an unusually large aneurysm of the first part of the
aortic arch. I do not intend to expand on either of them but merely record them for they are both instances of intrathoracic tumours of interest and came before me during the time I was collecting the cases which form the subject of my thesis. I shall now record my cases.
CASES admitted to the wards of the
Royal Southern Hospital, Liverpool.

CASE I.

Margaret O., aged 50, a midwife, admitted on December 13th 1909, gave a history of "pleurisy and pneumonia" seven weeks prior to admission. The pneumonia she said had never cleared up and she was suffering from severe pain in the chest and an irritating cough. She had always enjoyed good health up to this attack but about a month before it came on she became troubled with a slight cough and also noticed that her voice had become somewhat hoarse. She had been losing weight rapidly in the last three months. She was spare and had a worried expression. The left pupil was larger than the right. Her breathing was very laboured and wheezing. Her voice was distinctly hoarse and at times there was almost complete aphonia. Her cough was distinctly brassy in character, troublesome and accompanied by a muco-purulent expectoration, in which no tubercle bacilli was found.

On physical examination the left half of the chest was somewhat retracted and the movement on the same side was deficient especially in the upper third. Resonance was impaired throughout, the
upper third giving a modified boxy note, the lower
two-thirds a more or less dull note. Over the area
giving the boxy note vocal fremitus was increased,
the breathing was tubular and vocal resonance marked-
ly increased, especially behind. Over the rest of
the lung vocal-fremitus was diminished, the breath-
ing was very faint (being absent in some places)
and vocal resonance was slightly diminished. On the
right side the physical signs were all exaggerated.

In the other systems there was nothing to note.
Laryngoscopic examination of the throat revealed
paralysis of the left vocal cord, but it was felt
that the condition of the larynx did not sufficient-
ly account for the intense dyspnoea the patient was
suffering from, for she could at times hardly
breathe.

The left chest was explored with a needle in
two different places but nothing withdrawn. She
was then X-rayed and on the screen a dull area ap-
peared situated between the spine and the vertebral
border of the scapula. On this area being explored
a thick viscid fluid was withdrawn, brownish in
colour. It was sterile and consisted of dead leuco-
cytes and red cells. As we afterwards found out
the needle had penetrated into an abscess cavity in
the lung.

43.
Ten days after admission the patient died suddenly during an attack of paroxysmal dyspnoea.

At the necropsy a large growth encircled by the arch of the aorta and partially surrounding it and involving the root of the left lung was found. The left bronchus was almost completely infiltrated with the growth which had spread into the upper third of the lung towards the back. The portion of the growth was degenerating and abscess cavities had formed. The rest of the lung was in a partially collapsed state. The tracheal glands were also infiltrated. The growth had begun to spread to the right side but as yet the right bronchus was still untouched. This case is a good example of the great difficulty met with in diagnosis sometimes. We once thought it was a case of aortic aneurysm complicated with a localized empyema. There were of course no heart symptoms, but as there were no secondary growths anywhere we could not jump to the conclusion that it was malignant.

The growth was a primary lymphosarcoma showing a white surface when cut a milky white juice escaping from it. The left recurrent laryngeal nerve was embedded in the growth. The aorta was not compressed. On the next page I show photographs of the growth and its microscopical characters.
LYMPHOSARCOMA OF MEDIASTINUM.

Specimen. Case I M.O.
Lungs taken away.
No. I. Low power view of a section from the growth. At first glance it looks like a section from an ordinary lymphoid tissue gland. The high power no. II however shows the different sizes and shapes of the sarcomatous cells and the infiltration of the connective tissue by the cells.
CASE II.

George M., aged 32, a grocer admitted December 15th 1909 suffering from shortness of breath and pain in the right side for the last 6 weeks. Two months prior to admission a sarcomatous tumour was removed from the lower jaw on the left side. Shortly after this operation he developed a severe pain in the right side, he began to cough a good deal and a feeling of lassitude got hold of him. He looked decidedly ill although as yet there was no evident loss of flesh. He was coughing a good deal, and the sputum was copious and frothy. There was no alteration in voice, but he became extremely short of breath on the slightest exertion. On physical examination the superficial veins of the neck, chest and arms were dilated and tortuous, and there was slight oedema as well. The right half of the chest had a very full appearance as compared with the left half, but its movement was impaired. There was absolute dulness over the right side except from the apex downwards to the spine of the scapula over which area the resonance was impaired. Vocal fremitus was absent over the whole lung except over this area where it was greatly diminished. The breath sounds were absent over the lower two-thirds of the lung and faint and bronchial in char-
acter over the upper third. On the left side the physical signs were exaggerated the breathing sounds being puerile in character.

The heart was not displaced and a well marked presystolic murmur was audible in the mitral area. Liver dulness extended four inches below the costal margin. The spleen was not palpable.

From the physical signs it was evident that there was fluid in the right side. He was tapped the day after admission and 31 ounces of clear fluid was withdrawn. This afforded great relief, his dyspnoea and discomfort diminishing to a considerable extent. Curiously enough faint breath sounds could now be heard in patches over the whole lung and over these areas where there was formerly stoney dulness there was no impaired resonance. This undoubtedly was due to areas of healthy lung tissue here and there. The pleural cavity however soon filled up again and he was subsequently tapped four times, the amount varying from 30 to 40 ounces each time. On the third occasion the fluid was slightly bloodstained, but on the last occasion it was practically pure blood. His temperature was more or less always subnormal. Four days prior to his death which took place 25 days after admission, both his arms became extremely swollen, also his chest and abdominal wall, and his dyspnoea became intense.
His features now assumed a definite cyanotic aspect. The pleuritic fluid was examined and epithelial cells, red blood corpuscles and lymphocytes were found in it, but no malignant cells were present.

At the necropsy the right pleuritic cavity was filled with very blood-stained fluid. The whole lung was practically converted into a mass of malignant growth. The mediastinum itself was one mass of growth, the right pulmonary root being entirely incorporated. On removing the lung the right pleura was found to be involved everywhere especially so over the diaphragm where numerous tubercous growths were observed. The pericardium was involved also the left ventricular wall, the pericardial sac being filled with blood stained fluid. Cutting through the lung, tumours varying in size were studied throughout the organ, some being in a state of degeneration. Several infarcts were also noticed. Here and there islets of healthy lung tissue could be found. The right bronchus was practically obliterated. Secondary growths were also found in the liver, spleen and kidneys. The diaphragm on the right side was about one inch in thickness. The liver was much enlarged. Both the innominate veins, and also the superior vena cava, the vagus and the phrenic nerves on the right side were incorporated in the growth. Why the vocal cords
were not paralysed I cannot understand. In the accompanying photographs will be seen the specimen, and the microscopical characters of the various organs affected. This case illustrates the fact that nearly always in cases of sarcomas of the bones, the metastases are found in the lung. It also proves how quickly the pleural effusion refills after tapping — within 20 days he was tapped five times, the amounts varying from 30 to 40 ounces. Obstruction to the superior vena cava and consequently the vena cava veins gave rise to oedema of the tissues of the upper limbs and abdominal wall, but there was no ascites.
CASE II

- Epiglottis
- Trachea laid open
- Right bronchus obliterated
- Lung converted into a mass of growth
- Diaphragm with tuberous growths on its pulmonary aspect

Heart

LEFT BRONCHUS
By some mistake in the part of the printers, the microscopical section photographs of Case 114-115 got mixed. I shall indicate which they belong by affixing number of Case.

_Case XIII._ Low power.
Section from growth in the kidney, showing the infiltration of cancer cells and young connective tissue stroma.

_Case XIII._ High power.
Section of kidney, shows malignant cells and Malpighian bodies.
Case III. Low power.
Section from pleura showing the cancer cells in between the connective tissue of the pleura.

Case III. Low power.
Section from the pericardium showing malignant cell infiltration.
Case III. Low power.
Section showing infiltration of the fibrous ligament by cancerous cells.

Case III. Low power.
Section showing long tubous vessels in the malpighian part.
CASE III.

Thomas B., aged 55, Inspector, was admitted September the 11th, 1909, suffering from acute rheumatism and pleurisy with effusion, a diagnosis perfectly justified at the time from the physical signs and symptoms. During the eight weeks which preceded his admission he suffered from swollen and painful joints, the ankle, knee, wrist and elbow joints being chiefly affected. He also had pain in the left side and in his back. A week prior to admission he became troubled with shortness of breath, a cough and sleeplessness. He was fairly well nourished, but had a bright flush on his cheeks, when admitted. The joints were slightly swollen and painful but the chief trouble was a lancinating pain in the left chest shooting to the sternum and down the left arm.

On physical examination the chest was found to be well formed, the interspaces on the left side somewhat bulging outwards. The movement on the left side was absolutely abolished, and there was absolute dulness all over the left chest except for a small area in the infraclavicular region where a well-marked boxy note was obtained. Breath sounds abolished everywhere on the left side except near
the apex where hollow tubular breathing could be distinguished, but we had a suspicion that it was the breath sounds conducted directly from the trachea we heard; vocal fremitus and vocal resonance was absent except at the very top where the former was diminished and the latter degophonic in character. When percussing the resistance so characteristic of fluid could be felt by the finger. Left supraclavicular glands enlarged. The heart was pulled over to the healthy side, the apex beat being best heard in the epigastric angle about ½ inch to the right of the middle line. On the right side the physical signs were exaggerated. The dulness extended across the middle line of the chest to the right side. The heart of course was pulled to that side, and this fact was sufficient to account for it. The urinary and digestive systems were all right. The tongue was furred. Five days after admission the rheumatism had disappeared under the treatment of salicylates of sodium, but the pain in the chest persisted and indeed grew worse. His appetite became poor and he gradually became thinner and thinner. The skin over the left chest became hyperaesthetic. Seven days after admission he was tapped and 40 ounces of slightly blood tinged fluid was withdrawn. This, however, made no appreciable difference in the physical signs, the only difference
being that the upper half of the left chest became slightly resonant. The patient however felt somewhat relieved. The pleural cavity however quickly filled up again and he had to be tapped repeatedly, as much as 85 ounces being sometimes withdrawn, and every subsequent withdrawal was more blood-stained than the former. The fluid was examined but only blood cells were found in it. All cultures proved sterile. Some 8 weeks after the first tapping was performed a small nodule appeared at the seat of puncture. This nodule was in the skin and subcutaneous tissues. It was cut out and examined and found to be malignant, thus confirming our diagnosis of the case. He got more and more emaciated and ultimately died, 3 months after admission. I may add here that although the expression of his face assumed a very anxious and worried aspect he never developed the cachexia so typical in abdominal malignant disease. His temperature was always more or less normal. He had marked finger clubbing.

At the necropsy the left pleural cavity was found filled with blood stained fluid and blood clot. The lung was entirely collapsed and about the size of a man's fist. The parietal pleura all round was diseased and about half an inch thick. The pericardium was infiltrated and thickened and
the pericardial sac contained bloodstained fluid. The pleura encircling the root of the lung was diseased and the disease had begun to attack the contents of the roots of the lung entirely obliterating the bronchus and vessels. The disease had spread through the diaphragm and had attacked the falciform ligament of the liver, and the stomach wall. On cutting into the lung it was composed entirely of gangrenous material no healthy lung tissue being discernible. We were thus right in our suspicion that the breaths heard at the apex were those conducted from the trachea. The diseased pleura was examined microscopically and it was found to be an endothelioma, which was primary. Photographs of microscopic sections are shown of the various organs affected. In this case there were no pupillary symptoms or vocal cord paralysis.
Case 11. Low power
Section showing normal liver tissue and sarcomatous infiltration in opposite half. Note the irregular shape of sarcomatous cells.

Case 12
Section of kidney and growth. (Sarcoma.)
Case II (high power.)
Section from the growth in the lung.
Shows connective tissue and malignant cells.

Case II low power
Section of heart, heart muscle invaded by growth.
Before describing four other cases which came under my notice at the Royal Southern Hospital, I shall describe two cases I came across during the last six weeks while acting as locum, one case at Stockport, the other at Batley.

**CASE IV.**

Barbara H., aged 54, housewife, complained of pain in the left side of the chest and of a very troublesome cough. Two years ago she underwent an operation for cancer of the left mamma. The operation proved successful and she was in apparently good health until 4 months before I saw her at which time a cough took hold of her which gradually become more and more troublesome, accompanied by a frothy mucoid expectoration and a shooting pain in the chest. She had a haggard expression and looked emaciated. On physical examination the resulting scar of the operation was there and looked very healthy. Movement on the left side was diminished. Resonance was diminished in the upper third and absolutely abolished in the lower two-thirds, the finger meeting with marked resistance during percussion. Vocal fremitus was increased over the area of diminished resonance but absolutely abolished over the lower two-thirds. The breath sounds
were bronchial in character with expiration prolonged in the upper third, but abolished over the lower two-thirds. Vocal resonance increased above and diminished over the lower two-thirds. The heart was pulled over to the right side, the apex beat being best heard in the epigastrium. The right lung was normal except for the base to the extent of 3 inches where there was evidence of fluid. The liver was enlarged. The patient got worse and worse by degrees and although I did not see the end, I had no doubt that the end would come within another three or four weeks. There is no doubt whatsoever that here I was dealing with a case of malignant disease of the lung, in all probability cancer and secondary to the growth in the mamma which was removed 2 years ago. The glands above the clavicle on the left side were enlarged. There was however no oedema or enlarged superficial veins. Judging from the physical signs I should say the growth had attacked the upper third of the lung, spread along the bronchi and its ramifications from the root, and that there was a good deal of pleural effusion giving rise to the typical physical signs in the lower two-thirds. Whether the right base was the victim of malignant growth also I cannot say, but there certainly was evidence of fluid. Dr. Goulden of Stockport promised to send me the result of the post morten,

62.
should he succeed in getting one, and I feel confident that what we surmised would turn out to be correct.

**CASE V.**

Ben H., aged 50., labourer, residing at Batley in West Riding, suffering from severe cough and pain in the chest. Had enjoyed good health up to the time the doctor saw him, and had never been laid up for any illness. The doctor, Dr. Stuart, for whom I acted was sent for three months ago, the patient having suddenly had a severe attack of haemoptysis. The haemoptysis went on more or less for a few weeks and the patient had to take to bed. The doctor was puzzled for he had known the patient for a healthy man. He had the sputum examined several times, but found no tubercle bacilli, but he came to the conclusion that the man was suffering from fibroid phthisis. The man got thinner and thinner and when I saw him three weeks ago he looked indeed very poorly. He had had no haemoptysis for the last eight weeks but on looking at his sputum I found it to be of the red currant jelly variety. I examined him; the right side retracted, movements diminished on that side, resonance impaired, but the side still fairly tympanitic, but the striking feature of the case was that although resonance was still retained
to a considerable extent, vocal fremitus was entirely lost and the breath sounds could not be heard. An interesting state of affairs. The physical signs told me at once that I was dealing with an obstruction of the main bronchus on the right side; on the left side the physical signs were all exaggerated. I at once came to the conclusion that I was dealing with a case of malignant disease situated at the root of the lung and probably originating in the mediastinum.

Haemoptysis is often the earliest symptom of cancer of the lung and is very often fatal. He was sweating a good deal, a fact in favour of phthisis, but also in one with malignant disease, for he was extremely weak and that is quite sufficient to account for it. Of course it is quite likely that he may be the victim of both tubercle and malignant disease of the lung, for the two diseases sometimes may occur together, a fact that should not be overlooked. His cough was extremely troublesome and dyspnoea was so intense that he often had to grasp for breath. His pupils were equal and as yet he had no enlarged glands anywhere. The liver was just palpable. The heart was normal.

For this man likewise I felt there was only another three or four weeks of life, and when his own doctor saw him with me, he agreed with me that the condi-
tion was one of malignant disease affecting some part of the respiratory organs inside the thorax.

CASE VI.

Robert W., aged 18, teacher, was admitted on March 14th, 1910, suffering from Bright's disease. The history he gave was as follows:— Three weeks prior to admission he developed a pain in the upper part of the chest just under the manubrium sterni. The pain was of a dull aching character, increased when he ate and he had to make an effort to swallow. This pain somewhat abated, but he soon became conscious of another in the right lumbar region, but it disappeared a few days after, leaving his abdomen however in a swollen condition, and not long after his legs and feet started to swell too. There was nothing in either the family or previous history to suggest anything. On admission he was pale and of a sallow complexion. Face and eyelids were puffy; the abdomen was distended and the abdominal parietes were markedly oedematous and very tender. The oedema here was so great as to form a marked pubic fold in front and an extensive pad in the loins behind. The thighs, legs and feet were very oedematous and painful. The chest and arms were free from oedema. Cardiac dulness not increased.
to the right or left but there was a dome-shaped area of dulness under the sternum extending up to upper border of second rib. The cardiac sounds were normal. The chest moved freely on both sides. Resonance normal in front on both sides. Behind there is dulness from the 7th rib downwards and this extends forward as far as the mid-axillary line. The air entry in the right lung is markedly less than that of the left, especially as far as the lower lobe of the right side is concerned. Over the dull area the breath sounds are almost abolished, vocal resonance diminished and vocal fremitus absent. Liver enlarged and a distinct thrill got. No albumin or blood in urine.

X-rays showed considerable dulness to the right of the heart extending up to the right sterno-clavicular function. Blood examination showed a slight anaemia, but the whites were normal.

This case is very similar to the one recorded by Dr. Lloyd Roberts in the Lancet of November 1903. In this case the heart and kidneys were in a perfect state of health and the only thing to account for the general anasarca was some obstruction to the circulation, and from the situations of the oedema there was no doubt that the superior vena cava, the inferior vena cava and the azygos veins were in-
In other words the obstruction was in the chest. To decide the nature of the obstruction was another thing. Aneurysm was excluded. We also excluded pericardial effusion. The only thing it was most likely to be was either a generalised mediastinitis, or a malignant growth, for although the patient was only 18, malignant growths are by no means uncommon at that period of life. The obstruction is evidently of a permanent nature, for up to the present, although the patient has been kept in bed, the oedema although somewhat less, still persists to a marked extent.

CASE VII.

John F., aged 32, labourer, admitted January 26th 1910 for swelling of legs and abdomen. This came on three weeks before admission, first starting in the legs. Latterly his face has also become swollen. Had served in the ranks and ten years and had syphilis for which he was treated for 6 months being cured at the end of that time.

He had a very puffed up appearance. Face and eyelids were swollen, there was slight oedema of the chest, but the abdominal parietes was very oedematous and there was a distinct abdominal thrill. The loins very exceedingly swollen and
painful and so were the legs and feet. The liver dulness extended 4 inches below the costal margin. The heart and kidneys were in a normal state of health. In the respiratory system the only thing of note was that the air entry was markedly diminished.

This case like the former suggested some obstruction in the thorax.

The history of specific infection made us suspect a gummatous infiltration of the posterior mediastinum. We therefore gave no treatment for a fortnight but kept him in bed. At the end of that period there was no appreciable change in the patient's condition. We then started him on doses of potassium iodide and liquor hydrargyri perchloridi and within three weeks the oedema had practically all disappeared. There was thus no doubt that the condition here was due to mediastinal tumour of a gummatous nature. I should say that the gumma was in the posterior mediastinum and pressed on the right auricle of the heart.

I shall now describe the case of the aortic aneurysm and that of the malignant growth of the oesophagus. They were both tumours of considerable size situated in the superior mediastinum.
CASE VIII.

The patient, a male, aged 60, was admitted into the accident ward on the 20th December 1909. He was perspiring profusely, his ears, nose, lower part of the face, his neck and upper part of chest and arms were of a peculiar bluish colour. The forehead was of a ghastly pallor. The rest of the body was of a normal colour. He was conscious, but had no inclination to answer questions. His pupils were equal, his pulse was fairly good and of the same rate in both radials, which were hard and tortuous. He preferred lying on the right side. He showed no signs of dyspnoea but complained of a feeling of tightness across the chest. He had always enjoyed good health and had never been laid up with any trouble, but had not been told that his heart was weak. On the morning of admission he was carrying a heavy beam of timber, suddenly felt faint and collapsed, and was brought in immediately to the Hospital. The veins of the head, face, neck and arms were engorged, and there was distinct pulsation in the veins of the neck, at every beat of the heart their valves could be seen standing out quite distinctly. To the right of the sternum there was a heaving pulsation of a diffuse character but limited more or less to the second and third
spaces. Percussion revealed dulness extending to the right of the sternum and upwards to the right of the manubrium. The dulness extended outwards for about 3 inches. The left ventricle was hypertrophied, the apex beat being palpable in the seventh interspace and one inch and a half to the left of the nipple line. On auscultating to the right of the aortic area a rumbling murmur, more or less continuous, and intensified with systole was audible. Murmurs were heard in all the areas. There was no tracheal tugging. We opened a vein in the right arm. The flowing of the blood had a distinct pulsating character but no improvement came about in his colour. He became extremely restless and died four and a half hours after admission. We had no doubt we were dealing with an aneurysm which had ruptured into a vein, and at the necropsy we were convinced we were right. The heart was much hypertrophied. There was an aneurysm involving more or less the whole arch whose size equalled that of the heart itself. It was the biggest I had as yet seen. The rupture had taken place into the superior vena cava and this undoubtedly happened at the time he was carrying the beam of timber. The arteries throughout were extensively diseased, calcareous masses being
found in the aorta. The case was read by Dr. Lloyd Roberts before the Liverpool Medical Institute. It was almost inconceivable how a man suffering from a condition extremely serious and which he must have had for many years could have attended his work daily without feeling ill.

Another feature of the case was that there were no pupil symptoms, and no tracheal tugging. These may have been present before he came under my notice, but at least were not when admitted. I add photographs of the aneurysm.
Photo of Aortic Aneurysm, ruptured into Superior Vena Cava.

CASE VIII.
CASE IX.

James B., aged 54, boiler maker, admitted 12th December 1909 complaining of inability to swallow solid food. Three months ago he began to be troubled with a pain in the upper part of his chest. The pain was intermittent in character and he had it more or less every day. Eight weeks later he had difficulty with the swallowing of his food, at first slight but the difficulty increased and he can now only swallow liquids. He had lost about 3 stone in the last three months.

Except for the dysphagia he had no trouble anywhere else. When given fluids to drink it was evident that they accumulated in the upper part of his oesophagus before ultimately going into the stomach. Solids he could not take at all. He was then subjected to the X-rays. Nothing could be seen anywhere. While screened he was given a capsule containing bismuth carbonate. This was seen to pass down and stop opposite the aortic arch. (He was being screened sideways). He then took some bismuth milk and this all accumulated around the capsule and upwards ballooning out that part of the oesophagus evidently above the stricture. Below the capsule could be seen a more or less diffused shadow which was no doubt the tumour and through the middle of this mass the bismuth milk could be seen.
running down in a thin streak. These facts can all be seen on the accompanying X-ray photograph, which, although not a clear one shows the ballooned upper part of the oesophagus containing the bismuth milk and the shadow in front of this is that of the aortic arch. The spine is seen faintly behind the oesophagus and the edge of the sternum is seen in front of the aorta. The clavicles are shown rather indistinctly above.
Very little remains to be said in conclusion to the subject of Intrathoracic growths. They are numerous, and I have only touched on the most important of them and these I have endeavoured to show present a very interesting study in clinical phenomena. They are, I mean the malignant growths of the lung and mediastinum, perhaps not so uncommon as is generally supposed, for as I have remarked before, they are not always diagnosed and many cases are never seen by a medical man. It is unfortunate for those who are afflicted with them that they are beyond surgical aid, and that death only can stop their suffering. The physician can only alleviate their suffering. With these few remarks I conclude what I had to say about the subject of my thesis.
REFERENCES.


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