

On Malignant Tumours arising within the Chest,

With an Illustrative Case.

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Cancerous disease occurring primarily within the chest, though comparatively rare, is yet sufficiently often met with, for us to bear it well in mind in our diagnosis of certain obscure affections of that region, especially those with leading symptoms of pleurisy, aneurism, phthisis, or chronic pneumonia. In many of the cases recorded the true nature of the disease was only discovered after death, and this, too, at the hands of the most skilled observers. The difficulties of diagnosis, therefore, being commonly so great, it is a matter of importance, in order to obtain a better generalisation of the disease than already exists, that careful record should be made of every case that comes under our notice.

The remarks in this paper are founded partly, upon a case of the kind which occurred in private practice, presenting difficulties of diagnosis that baffled the powers of all who saw it, and these included two of the most eminent and experienced physicians in London. The patient died, and a post mortem examination, though an incomplete one, was allowed by the relatives to be made, by which the obscurity in the clinical features of the case, was in great measure made clear. Notes

of this case are here detailed, and thirty-two others of a similar nature, that are recorded in the periodicals for ten or twelve years past, have been collated, and an analysis of the whole given.

Case 1. C.S., aged 49 years, was lately in business as a photographer, but for 15 years previously, up to 1875, he led an active, out-of-door life in Cape Colony. His father died of bronchitis at the age of 85, his mother, of scarlet fever when he was seven years old, and C.S. himself also caught the affection, and suffered thereafter from dropsy. He had three brothers and two sisters; one brother died in childhood, another was drowned, and the third is alive. Of the two sisters, both were highly nervous subjects; one died of "Spasm of the heart," the other is still living. C.S. was always led to believe that he was a seven-months' child. There was no history of cancer in the family of either father or mother; and there was no evidence of syphilis in the case. His health after childhood became very good, and he went to the West Coast of Africa at the age of twenty-one. He remained there from March, 1859, to February, 1860, and during his stay had several attacks of "fever and ague," which induced him to return home. He was very weak and ill for several months after this, suffering from recurring chills, and he had an attack of jaundice. In the same year he went to the Cape, and led a very active life in Kaffraria. In 1862 he caught

a cold which gave rise to troublesome sneezing fits, and during the next year or two he had occasional attacks of "fever." From 1866 to 1871 he never had any ailment excepting "a perpetual cold in the head," which resulted in complete loss of smell, and almost of taste, for the time. Six years later when he had returned to England, it was discovered that he was suffering from nasal polypus, and this was successfully removed by Mr. Arthur Durham.

In the beginning of 1884 he had his first attack of bronchitis and blood-spitting. It was thought by himself, however, that the blood came from his throat, and on consulting Mr. Durham about it, he was told that the blood-vessels in the throat were in a congested state, and might possibly be the source of it. He now had occasional asthmatic attacks, lasting each about a couple of days; cough, also, with frothy expectoration, became a frequent symptom; and from this time onwards to the last, blood-spitting occurred at intervals. The blood was bright-coloured, and in streaks among the mucus. Business troubles came upon him in 1885, giving rise to great mental worry, and he soon broke down. Attacks of an asthmatic character became rather frequent, and at Easter, 1886, after hurrying to catch a train, he had a severe attack of dyspnoea, and spat up a considerable amount of blood.

My first visit to him was in January, 1885, and his appearance then was not suggestive of any serious ailment. He had a ruddy colour with very slight bronzing of the skin,

had dark-brown hair becoming grey, and spoke cheerfully and with much intelligence. His Eyeballs were rather prominent, but there was no visible enlargement of the thyroid gland. He had fairly good muscular development, was somewhat round-shouldered, with neck bent a little forward, and looked like a man who had had trouble with his breathing. On watching him in the intervals between the paroxysmal attacks of dyspnea, there was little to be seen amiss with him, but very slight exertion caused his breathing to become laboured. During the paroxysmal attacks, there were loud, cooing sounds throughout the chest, slight cough, and frothy expectoration with occasional streaks of blood in it. His appetite was capricious, but as a rule he ate heartily. One trouble, however, was, obstinate Constipation, and he frequently took podophyllin and Rhubarb for its relief.

I examined him carefully several times during 1885, but never could detect anything wrong in the chest, except a slightly prolonged expiration, and a few moist sounds in the larger bronchi now and again. The blood-spitting continued, however. He had slight attacks of dyspnea, and in April, 1886, having caught cold during a journey to Hastings, my friend Dr. Jardine saw him for me in my absence, and he, too, thought there was very little wrong with the lungs at that time. On May 8th he had another fit of coughing and blood-spitting, and began to feel unwell.

There was no special pain, and the only symptoms that he complained of were, the paroxysmal cough, the shortness of breath at times, and the blood-spitting. Again I examined him: He had lost flesh during the past year, but his appearance apart from this, was unaltered. There was good expansion of both sides of the chest on deep inspiration, and vocal fremitus was natural. The percussion-note was resonant over both lungs, front and back, except at a point behind, near the angle of the left scapula, where there was a dull note comparatively, and fine crepitations could be heard in this area. The vocal resonance seemed to be normal. The heart-sounds were natural; pulse, 80, rather feeble; respirations, 19; temperature, 99°F, in the axilla. There was little coughing, and but slight expectoration, this latter maintaining its old character. His appetite varied, but upon the whole he consumed a good deal of food. Tonic treatment seemed to improve his condition for a while, and he went to business irregularly. During May he got rapidly worse; the dullness on the left side, behind, extended; the vocal fremitus was rather increased; dry, sibilant rales could be heard below the clavicle in front, but fine crepitations were heard for a short while at the back, over the interscapular area and at the base; and along with this was bronchophony. The whole lower lobe of the lung seemed to be involved in inflammation, but the right lung was quite healthy.

A remarkable feature in the case now that the physi-

cal signs of inflammatory mischief were so well marked, was the persistent low temperature — it being scarcely normal. Respirations, 20; pulse, 90, small and soft. Glairy white mucus, occasionally streaked with blood, was expectorated, and there was no special pain. The dulness and other physical signs noted above, soon extended to the apex of the lung also, and the expansion of the whole left side of the chest became much impaired.

At the request of his friends, the patient consulted Sir Andrew Clark in May, and so little was there to be gathered of the real nature of the case, from a physical examination of it then, that Sir Andrew thought it to be one of "fibroid change with bronchiectasis." He told the patient that the lung trouble was evidently of old-standing, and there was nothing in his complaint, so far as he could detect, to prevent him living for many years. In the beginning of June, glandular enlargements appeared at the articulation of the lower jaw on both sides. On June 14th he had a sub-acute attack: the heart's action became visible through the chest wall, the pulse was more frequent — 102 per minute; temperature 100°F.; respirations 22. By resting in bed he improved gradually, and on June 20th, was well enough to go out of doors and take a short walk. On June 21st, however, he was very ill, suffering from an attack of pericarditis which, in 48 hours, resulted in effusion into the pericardial sac. The cardiac dulness was increased

laterally, especially to the right - absolute dulness extending to the right side of the sternum at the level of the 4th rib; vertically, it was also increased, but the pulmonary dulness over the left infra-clavicular region, merged with it in such a way as to make it difficult to define. There was a good deal of pulsatory movement in the cardiac area all the while, but when the effusion was greatest this was considerably lessened. The movements of the heart were very marked as the effusion cleared off again, but there was no displacement, the apex-beat continuing to the last in its normal position. Friction-sounds were very loud at first, then they gradually became obscured, but never entirely so at the left margin of dulness. There was also a systolic murmur to be heard over the sternum, near the right Sterno-clavicular articulation. There was great dyspnoea, and the patient had to be propped up in bed; but local pain was not great - Opium was given, and afterwards, the pre-cordial region blistered. Improvement soon took place in the heart trouble - the fluid was absorbed, and friction-sounds again were heard. But emaciation was going on slowly, and the glandular enlargements in the neck had increased rapidly to growths the size of a walnut. One of these growths was in front of the right ear, just over the articulation of the jaw, and the other on the left side, was at a rather lower level, embracing the anterior margin of the sterno-mastoid muscle. They were rather

tender to the touch at first, but after a while they became firmer in consistence and less sensitive, and adhered to the structures around them.

The patient was still able to take drives in the open air, and although he ate a fair quantity of food and digested it well, he continued to lose flesh - Through taking the opium he suffered more than ever from Constipation, and Compound Rhubarb pill was given, and Eucemas used, to counteract it. During the middle of August there were a few days in which he felt much better, and he foolishly strolled into the garden to gather pears. He threw up a block of wood into the pear-trees to shake down the fruit, and owing to the exertion, on the following day, he was laid up with a second attack of pericarditis and greatly increased pain and dyspnoea - Effusion into the pericardium again took place, and although to a less extent than before, it was longer in clearing away.

Complete dulness prevailed over the entire left side of the chest now, both in front and at the back, and it was hardly possible to map out the cardiac dulness by percussion from that of the lung - Vocal fremitus was greatly impaired, even at the apex, in front. There was still a little air entering the lung, however, and moist rales could occasionally be heard, especially in the interscapular region - Vocal resonance was audible, but greatly impaired at the apex in front, and in the interscapular space on the left side - The heart-sounds were also quite audible

at the back in this same region, but at the base, the voice could only be very indistinctly heard, and hardly felt at all on palpation. The right side all the while remained perfectly healthy.

A Curiously-interesting feature in the case as it now advanced, was the laboured working of the heart, rendered visible by the movements of the chest wall in front of it, these movements being as high as the second intercostal space, but not extending lower than the normal position of the apex-beat. The sensation on placing the hand over it, was very peculiar, and quite indescribable.

The gradual progress of the case from bad to worse, induced us to have a consultation with Dr. Wilson Fox, and I drove with the patient to see that physician on September 1st. He made a most minute examination of the case, and remarked upon the great sense of resistance there was on percussion - He noted the pericardial friction-sounds, and the murmur at the base of the heart, which latter he said might be due to pressure; took into consideration the enlarged glands, and all the symptoms present, and said there was only definite evidence of pericarditis, and of pneumonic consolidation, possibly complicated with pleurisy; there might be a cancerous growth, but that he could not decide upon. He suggested that I should make an exploratory puncture in search of serous effusion, and pronounced it a very grave case - I did make an exploration two days afterwards

with a large-sized, hypodermic needle and syringe, at the level of the 8th rib behind, but no fluid came.

On measurement, the left (affected) side of the chest was barely a quarter of an inch less than the right, at the nipple level. There was, apparently, some slight flattening at the left apex, on looking over the shoulder from above; and vocal fremitus was absent behind.

All the abdominal organs appeared to be healthy: there was no liver or splenic enlargement, and no albumen in the urine. His blood, both of that which came from the lung and from the prick of a needle, shewed no other morbid sign than, perhaps, a slight increase in the white corpuscles; and he never had a marked cachectic appearance.

On September 20th, the temperature was 98°F .; pulse, 100, weak and soft; respirations, 18 per minute. Incontinence of urine now became a troublesome symptom, and he shewed a good deal of mental excitement; generally followed by fits of depression. About this time his senses became abnormally acute. He heard whisperings in a way that astonished his attendants, and complained of smells that were barely perceptible to others. On examination with the ophthalmoscope, there was no optic neuritis to be seen, neither was there any other changed state, of the eye, or of its movements. He had always been inclined to lie on the right side, and seldom turned for more than a few minutes on to the one affected, but now he could not change to the left at all without

suffering acute pain. In October he became apathetic, and would sit still for long periods without speaking to any one. The bowels were still very inactive, and laxatives and enemias had to be frequently given. The skin, always sensitive to rubefacients, became more so than ever - tincture of iodine produced great irritation, and caused the epidermis to peel off thickly afterwards. Hiccough, also, became occasionally troublesome, and there was restlessness and sleeplessness at night ~~and~~ unless opiates were given -

The relatives desired that Sir Andrew Clark should see him again, and he came accordingly, on October 20th. Sir Andrew said he had taken a note of the case and remembered it. He thought it to be one of Fibroid Change. On examining the Chest again he was surprised to find it in such a "dry state." The pericardial inflammation was a new feature, and he thought the heart "had given way at the base." There was a systolic mitral murmur to be heard also, but the loudest sounds were pericardial. The enlarged glands were rather a puzzle, but he did not see any good reason to alter his original diagnosis, and gave more hope than I myself felt inclined to give. Having begun to entertain the view that it might be cancer, in which Dr. Jardine agreed with me, I declared this to Sir Andrew, and asked him if he thought it might be so. But he said there was more evidence in favour of Fibroid Change, and in that case there was hope - He pre-

scribed a tonic and wrote out a dietary: food to be given every three hours, and opiates as before, to induce sleep and to calm the heart. He described the patient's appearance as being "statuesque," and thought that the mental depression might be followed by an outburst of violence.

October, 22nd. The pulse, 120, in character, feeble and soft, and somewhat irregular, but no inequality at the two wrists. The respirations, 11 per minute, were difficult to count because of hiccough, which varied from 17 to 19 per minute. This was a most troublesome symptom, and always commenced on awakening and after taking food. It lasted the greater part of the day, but sometimes ceased if he turned on to his side. The regular system of food-taking had a decidedly good effect upon him; the hollow spaces seemed to fill up a little and the glandular swellings appeared to be smaller. A slight mental improvement also, took place for a while, and he interested himself in general domestic affairs. The pupils were unaffected by his nightly grain of opium, and there was no optic neuritis. His voice, when he did speak, was clear and rather loud, but was produced as if with great effort. And he ate his food well, and swallowed it properly. Yet there was great physical weakness, and on one or two occasions when he got out of bed unassisted, he fell to the floor. He sat up in his chair daily for an hour or two, and if he happened to slip down into an uncomfortable position

there he remained without offering to raise himself. He would look at objects with a vacant stare for a long while at a time; and after taking his medicine, sometimes an expression of disgust would remain fixed on his features for a minute or more.

In the beginning of November he began to grow feebler. The veins all over the body became prominent, especially so in the feet and legs, but there was no oedema anywhere. The motions as well as the urine were now, unconsciously, passed in bed, and the case became a troublesome one to nurse. On November 11th, he became decidedly worse, the urine which had hitherto been quite clear, was loaded with urates. Pulse, very feeble, 124; respirations, 24; temperature, 98.8° F. in the axilla. He rambled incoherently; and ^{he} seemed to have some slight difficulty in swallowing his food. His heart's action was a most laboured one, but the friction sounds were less loud. There was no change in the lungs - and he still responded when asked to put out his tongue.

November, 13th. Pulse very feeble, 130; respirations, 32; temperature, 100° 6. There was no response to questions now, and he did not seem to recognise anyone. He groaned a good deal, and shouted out sometimes as if in pain. Pupils contracted. Veins everywhere very prominent, but still, no oedema. Perspiration was profuse, and it stained the pillow a yellow colour. The other signs and symptoms were unchanged. At 11 P.M. the temperature had risen to

103.5; pulse, 138; respirations, 32. Moaning continued all the while during expiration. There were slight convulsions at 6 A.M. and at 8 A.M. on the 14th, and he gradually sank, and died at 4 P.M.

I was permitted to make a post mortem examination on the 17th, and Dr. Jardine assisted me. The body was greatly emaciated, and greenish discoloration of the skin had commenced. On opening the chest, there were some adhesions to the upper and left side of the sternum, and to the cartilages of the ribs; these cartilages were very dense and hard to cut — and in the midst of the adhesions there was a hardened gland, about the size of a pea. On exploring the contents of the cavity, there was a bulging red mass to be seen, on the left side. Separation of the parts was most difficult, as everything seemed to be adhering one to the other — the pleural surfaces as well as all else. The bulging mass was the pericardium, and on making an incision into it, the knife entered the cavity of the right ventricle of the heart. This chamber was thin-walled, much dilated, of a dark-red colour, and filled with dark, fluid blood. The pericardium was adherent to the wall of the heart all round, so that there was no space for effused fluid, and the heart itself was bound down to the left lung. Adhesions prevented the passing of the hand into the pleural space, and it was only by working down gradually into the lung substance,

which was rather friable, that rounded masses could be felt, adhering firmly together. On separating one of these masses more outlying than the rest, it was found to be as large as a hen's egg, and to have the appearance of an enlarged gland. It was easily removed, just as if it had been encysted, and on making an incision into it, the texture was hard, the colour, yellowish-white, and to the touch, it felt rather greasy. At the root of the left lung could be felt the chief mass, somewhat nodular, and as big as one's fist. It extended backwards to the ribs, and adhered to them for a length of about three inches parallel with the spine, and two inches at right angles to it. The adhesions to the ribs were easily broken down, and a roughened surface could be felt where they had been, as if some erosion had taken place. From this central mass a portion was cut, with some of the lung-substance attached. The lung had been inflamed and destroyed, and its place taken by the new-growth. What did remain of lung-tissue was found to be engorged with blood, and to sink in water. Near the circumference of the tumour, on the left side, there was an appearance of ulceration, the lung-tissue being sloughy. The cut surface of the growth gave out very little creamy matter on scraping, and the structure was rather firm.

The heart with the pericardium was firmly bound down to the tumour posteriorly, and was of a most irreg-

ular shape — the left side being so pressed upon that it bulged in. The valves were normal, but the true condition of parts was difficult to make out, through the distortion caused by the pressure of the growth. It had invaded the muscular wall of the left ventricle, but did not project through it into the chamber. The descending aorta was compressed, but the vena cavae were free from it. The left bronchus occupied the middle of the new-growth, and seemed to be altogether obliterated by it, and the smaller bronchi were blocked by inflammatory products. The phrenic nerve passed quite through the mass, and the pneumo-gastric nerve and oesophagus were pressed upon and adhering to it. The ascending aorta and part of the arch of it were free.

The right lung was healthy throughout; there were no growths or enlarged glands to be found on that side anywhere; there was no emphysema of the anterior margin; only a few, very slight, pleuritic adhesions existed; and it floated lightly in water.

The abdominal viscera were not removed, as permission was only given to examine the chest; but exploration was made as far as possible from above.

The liver appeared to be normal in size with an even surface, and no hardened mass could be detected in connexion with it; neither were there any to be felt connected with the stomach, spleen or any other organ as far as could be examined in this unsatisfactory manner.

In the fresh state, a section of the tumour under the microscope, showed fibrous bands; large, epithelial-looking cells with granular matter in them, and, seemingly, more than one nucleus; a great number of dark, oat-shaped cells, much smaller than the rest; a few pus-cells; and crystals of cholesterol. But to make sure of the exact nature of the growth, I sent a portion of it to be examined by my old teacher, Professor D. J. Hamilton, and he gave an account of it as follows:—

"The tumour was of a somewhat anomalous nature. It was composed in large part of fibrous tissue, which invaded the alveolar walls of the lung, and spread from without inwards. So far it seemed to be a Croup; but shortly after causing this thickening of the alveolar walls, and when it had partially or completely filled and obliterated the alveolar cavities, it assumed an appearance which much resembled the meshwork, and enclosed cells, of a Cancer. The cells, however, in the meshes were very small — much smaller even than in a glandular cancer, such as that of the stomach or, secondarily, of the liver. On the whole, however, I am inclined to look upon it as a cancer, but where the primary tumour has arisen from I am at a loss to know. My examination threw little light upon this."

Remarks. The case is an interesting one in many particulars. In the first place, the belief of the family that the patient was a seven-months' child

is a fact of some interest, when modern views on the relation between the embryonic type of tissue and tumour-growths are considered. How far a shortened period of uterine life may influence the subsequent nutritional powers of the tissues, and conduce to the abnormal processes concerned in the growth of malignant tumours, is a subject which, so far as we are aware, has not been considered. In the case of C.S., there was a special proneness to develop tumour-growths, as was shewn by the appearance first of nasal polypus, then of cancerous growth within the chest. There was also, the long-continued "cold in the head," as a possible exciting cause of the former, and the bronchial irritation, whether inflammatory or neurotic, preceding the latter, which seem to be more than mere coincidences. But there was also the history of ague, which ought to be borne in mind, although the patient, apparently, did not suffer directly from it for a good many years before he died.

The cerebral symptoms also, which manifested themselves towards the last, and which may or may not have arisen from similar growths within the Cranium, are interesting. There was no direct sign of tumour of the brain. And bearing on this, was the evidence of a highly nervous temperament in his two sisters, and the fact that his second daughter shewed decided mental symptoms of a melancholic type - all pointing to a family

tendency in that direction. Many of the writers on the subject, from Sims' downwards, have noted specially, the occasional occurrence of cerebral troubles in intra-thoracic cancer; but in some of the cases, at least, this was associated with growths in the brain -

The co-existing inflammations of lungs, pleura and pericardium, also shew that it is not sufficient to make out either, or all, of these conditions in such cases, and there stop, thinking a complete diagnosis has been made, for, as is seen in this case, all were present, and something else besides; and this point is not generally made clear in the works on the subject. The signs of pleurisy found after death, prove that such a complication did exist, but it was not positively detected during life. It was unaccompanied by effusion from the beginning probably, and so, the exploratory puncture which was made, gave no help in diagnosis. Yet during life, the physical signs were such, that even Wilson Fox was led to suggest the possible existence of pleuritic effusion. As the puncturing of the tumour itself, and the drawing therefrom of the elements of cancer, has been suggested as the only sure means of detecting the disease, to reach the tumour in this case, it would have been necessary to do it low down in the inter-scapular space; and from the hardness of the growth, it is doubtful if the operation would have been successful. In the softer forms of medullary cancer, the case might be

1. Op. cit.

Different-

An extensive literature now exists on this subject, and Dr. Cockle, in his essay, "On Intra-thoracic Cancer," (1865), gives an interesting sketch of the earlier writings, with a list annexed of the authors, and the titles of their works. Hertz, in Ziemssen's "Cyclopaedia of the Practice of Medicine," Vol. V, under the heading, "New Growths in the Mediastinum," gives additional references. And numerous cases, with remarks upon them, occur, scattered through the periodicals. An excellent treatise, founded mostly upon personal experience, is that by Radon Bennett, entitled "Cancerous and other Intra-thoracic Growths" (1872); and in nearly all the principal works on 'Medicine,' particularly those by Stokes, Hughes Bennett, Walsh, and Graves, valuable information on the subject is given.

In their "Manual of Pathological Histology," Cornil and Ranvier, in discussing "Tumours of the lung," state that almost every kind may occur in it. They enumerate besides tubercle, the Sarcomata, Simple melanic tumours, Fibromata, Lipomata, Osteomata, Chondromata, and Carcinomata. Sarcoma, they say, has been observed in the lung only in the form of secondary nodules, following primary tumours in another part of the body, such as the bones, the testicle, the breast &c. But we would remark that if true Sarcoma does not occur primarily.

in the lung, there is a closely related growth which does, and that is the so-called Lympho-Sarcoma - a tumour, sometimes of very large size, arising in the bronchial, or mediastinal, glands, or, from some adjacent structure belonging to the connective-tissue group. The same authors also say of carcinoma of the lung, that it is more often situated in the right than in the left. This, no doubt, has ^{long} been the belief, but a wider survey will probably show that cancerous disease occurs about equally in both, and does not, therefore, require such specification. The remark made by Walcke, that the lungs, though frequently affected by secondary cancerous deposits, have little tendency when primarily affected, to be followed by secondary deposits in organs other than thoracic, is evidently true. But still, in our list of 33 cases, there are 4 which show secondary deposits, following primary affection in the lung, namely, numbers, 24, 25, 27, & 29 - these, however, appear to be Lympho-Sarcomas, and not true cancers.

In the secondary forms of carcinoma, as of sarcoma, the same structure is always seen as that in the primary growth, the tumour cells, or other germinal elements, being conveyed either through the lymphatic-, or blood-vascular system. One of these cells, full of vital activity, may plug a blood-vessel in the lung, and there grow and multiply, forming a nodule which invades and compresses the pulmonary tissue. The part played by the surrounding tissues in which such a cell finds lodgment, varies a good

deal. Proliferation of the cell-elements is excited, often resulting in the development of a large amount of connective-tissue; and leucocytes appear, and blood-vessels are developed to convey the requisite nutriment to the new growth. There is little tendency in these secondary growths to infiltrate the surrounding tissues; their boundaries are generally well-defined. They appear in the lung as widely-scattered nodules, minute in size, or as larger nodules, and sometimes, as flattened tubercles projecting from the surface of the lung. Carcinoma of the pleura often follows carcinoma of the lung, whether primary or secondary, and it also results from carcinoma of the breast by direct infection, the disease penetrating the wall of the chest and reaching the costal pleura. The lymphatic vessels of the visceral pleura seem to be the channel by which it then spreads, and they become inflamed and changed in structure by the new growth. All the kinds of carcinoma; encephaloid, scirrhous, colloid, hematoid, melanic, etc., occur both in the lungs and pleura.

But primary cancer of the lung, which is here specially considered, is also found, and in various forms. It may infiltrate the lung tissue; arise and spread from the root in lobular masses of varying size, with outlying nodules; or it may appear on the surface as tubercles. It may arise, apparently, in the alveoli of the lung, or in the bronchioles near them. Those occurring as solitary nodes progress and enlarge by filling up neighbouring alveoli; the lymphatics of

the part are also generally invaded, and the lymphatic glands become affected. One or more cancerous masses of large size may in this way be produced, which, sometimes at first, excite little irritation around them; but eventually, they destroy and displace large portions of the lung tissue. The interior of the bronchi, large and small, may be their original seat - the lining epithelium or the mucous glands forming the starting-point.

A feature of malignant tumours, which was noticed by the older pathologists, is the creamy juice which exudes from them on section. It is more abundant in Carcinoma than Sarcoma, but it does occur in the latter, especially in the round-celled variety. It varies a good deal in the different forms of the same species, and is dependent upon the amount of the cellular elements in them. Where the cellular elements greatly predominate their growth is rapid and their malignancy great, but in tumours which have the intercellular substance most abundant, and in which the texture approaches closer to normal, fully-developed fibrous-tissue, the destructive and spreading tendencies are slighter.

Under the microscope the Sarcomata show the connective-tissue type of structure, with the cellular constituents in great excess. The cells increase enormously in number, but seem never to reach the mature state. They are larger than the normally-developed cell of ordinary fibrous tissue, and contain one large, or several small

nuclei in their interior. They have the physical characters of the cells of the embryo arising from the mesoblast, but are unlike them functionally, in remaining at the lowest level of development to the last. Some reach a higher level than others, and so we pass from the round-celled variety, through the spindle-celled, until an almost mature normal tissue is reached, and a fibro-sarcoma, or even a fibroma presents itself. Some Sarcomata are pigmented in varying degrees from pink to dark-brown, and these are of a rather malignant kind. The colouring matter consists of amorphous granules lying in the cells, in the matrix, or in the walls of the vessels, and in some it is so fine as to present the appearance of diffuse staining. Another form of Sarcoma, belonging to the small round-celled kind, is that known as lympho-sarcoma, or lympho-adenoma, and it is a form which often occurs among the intra-thoracic tumours. In the early stages it is often vascular and soft, but with a strong tendency to rapid fibroid change, and sometimes, to caseation. It has a reticular stroma, very like that of a lymphatic gland, and, indeed, this may be in reality the original stroma of a gland, overgrown and indurated, until little else but fibrous tissue exists. During the process of change a large number of multi-nucleated cells are present, adherent to the trabeculae, and playing an important part in the hyperplasia; but afterwards, the meshes contain an abundance of small round-cells. It originates like all other Sarcomata

in some structure of the connective-tissue group. Its growth generally, is very rapid, and its destructive tendency, great, and within the chest it soon runs a fatal course.

The histological features of Carcinomata differ from the above chiefly in their cells, which, in the most malignant forms, constitute the greater part of their bulk. These cells are large, round or irregular-shaped, and are of the epithelial type. They have oval nuclei and large nucleoli, and a section in the fresh state, under the microscope, shows granular matter in them, and oil-globules in the field — for they have a great tendency to undergo fatty change. There is a fibrous stroma also, in the meshes of which these cells exist and multiply. Cornil and Ranvier lay stress upon this stroma as being the distinguishing feature in them, whilst others, like Jizler, attach most importance to their cellular elements. The stroma of Carcinoma is developed out of tissue of the connective-tissue group, as that of the blood-vessels, but the cellular elements, being epithelial, have a different origin, namely, from the structures arising out of the epiblast and hypoblast. They resemble to a slight degree the structure of a simple gland, but here again, a very low stage of development is reached, for there is no orderly arrangement of the cells. In the higher groups of the same class, the Adenomata, a nearer approach to true glandular structure is seen. On section many forms present a distinct mottling, owing to the cell-nests as they are

termed, being lighter in colour than their stroma, and this is often due to fatty degeneration in the cells.

The metastatic feature of malignancy in cancers, is the result in great part, of their structure. The alveoli in them communicate directly with the normal lymphatic vessels, and through this channel the cancerous elements are conveyed to the glands, and there induce the formation of secondary growths. The blood-vascular system, however, may also be the channel of communication, and widely-remote organs thereby become infected.

The physical differences existing among these tumours have given rise to various systems of classification, but the distinctions between them are not so wide as has been supposed. Between the colloid and medullary forms, for example, a complete difference of nature was believed by Cruveilhier and others, to exist. At present the colloid texture is understood to be due to a change in the cancer-cells, by which they become filled up with this gelatinous substance and perish. Many of the varieties of carcinoma, however, run into each other, and no great distinction can be drawn between the transition forms. In the same growth, indeed, may be seen, scirrhous in one part, and medullary portions in another. The variety depends very much upon the nature of the tissue in which it originates—particular organs being the seat generally, of a particular kind, as epithelioma of the squamous variety in the

skin, and epithelioma of the cylindrical variety in the intestine; and these give rise to secondary growths of the same character. But the forms occurring primarily within the chest, are mostly, encephaloid, scirrhous, and scirrho-encephaloid. The naked-eye appearances of the two unmixed kinds are often very characteristic, the former occurring as rounded nodules of very varying size, the latter looking like an extensive network throughout the lungs, on section.

For clinical reasons chiefly, some of the intra-thoracic tumours are described under the heading "Mediastinal," but this is not a very happy term, as many of them involve lungs, pleura, heart, œsophagus, diaphragm and other neighbouring tissues which are, naturally, beyond the mediastinal space. Yet there are tumours among them, mostly now described as lymphomatous, and closely related to the sarcomas, which appear to have a predilection for this space, and arise from one or another of the various structures within it—often most difficult to specify. But in what follows, ^{here,} no great distinction is made between these and the tumours which are more specifically described as "Cancer of the lung."

Many of these new-growths under discussion originate in the lymph-glands of the part, especially those along the course of the trachea and bronchi, and even from a persistent thymus. The connective-tissue of the mediastinum may give rise to them, likewise the pericardium, the

Arteritis of the large blood-vessels, and the periosteum of the sternum. They vary greatly in size, and may become very large, sometimes reaching the weight of twelve or fourteen pounds: Dr. Ferriar's case, quoted below, (*Medical Times*, I, 1885, page 145) weighed seven pounds, four ounces.

Analysis of Cases. A list of 32 cases enumerated at the end of this paper, which have been recorded in *The Lancet*, *Medical Times*, and *British Medical Journal*, with one exception, since 1872 — together with the case of C.S., already described; making 33 cases in all — of primary tumour within the chest, forms the basis of the analysis given below —

In 27 of the cases the sex is stated, — 18 being males, and 9 females. In 27 cases, too, the age is given, which shews a preponderance of the disease from 20 to 50 years:—

Years.	Cases.	Ages.
10-20	2	15, 12.
20-30	6	22, 24, 25, 29, 30, 30.
30-40	8	32, 32, 33, 37, 37, 37, 39, 39.
40-50	8	41, 41, 43, 43, 44, 44, 45, 49.
50-60	1	58.
60-70	2	61, 62.

In 22 cases it is definitely stated that only one lung was affected, and of these it was the left, 14 times, and the right, 7. One case is not stated. Both lungs were affected in 11, and of these, it predominated in one or the other.

1. Reynolds's System of Medicine, Vol. III, page 594.

about equally.

On comparing these numbers with other statistics given, the males here outnumber the females to an unusual degree. But they correspond closely with Riegel's figures given in Zimmesen's Cyclopadia, page 445. The proportion of men to women he states to be, as 2.4 to 1.1 — whether this refers to primary cases, or to secondary as well, is not stated. Richou Bennett's numbers are 20 men to 19 women, and his, certainly, include all kinds — Köhler, however, quoted by Cockle, gives account of 34 primary cases, and of these, 27 were males, and 7, females. These added to our own make the totals 45 males to 16 females, or, nearly 3 to 1.

As to age, most of the accounts agree, and with the exception of fewer cases than usual below 20 years, occurring in it, the above list fairly represents the General Conclusion.

But, as to which lung is most frequently affected, great difference of opinion exists. Many of the lists include secondary cases, ^{as well as} among the primary ones, and as both lungs are affected at the same time in the great majority of secondary cases, this modifies considerably the results. Walcke distinguishes between the cases in which the lungs were affected ab-initio, and those which were consecutive to growths in the mediastinum. These are, however, combined in the analysis given below.

Arviolat's, Köhler's, and Kleffens's lists, quoted by Cockle, 1. Op. cit. page 68.

give analyses of primary cases separately. The double cases of our own list, it must be stated, include those in which the disease started in one lung, and had by extension, reached and implicated the other before death. In one, the particular lung is not given.

	Cases.	Right-	Left.	Double.
Köhler's.	31	15	8	8
Aviolat's.	23	9	11	3
Kliffen's.	19	6	7	6
Bennett's.	39	9	14	16
Walsh's.	29	16	6	7
Our Own.	<u>33</u>	<u>7</u>	<u>14</u>	<u>11</u>
Totals.	174	62	60	51

The various forms of new-growth described in this collection, will best be shown by the following list:-

- 6 cases stated definitely to be encephaloid or medullary.
- 8 " possibly encephaloid, from their description.
- 3 " Scirrhus.
- 2 " Scirrho-encephaloid.
- 9 " described as Sarcoma or Lympho-sarcoma.
- 1 " probably Lympho-sarcoma.
- 1 " Lymphadenoma.
- 1 " Lymphoma.
- 1 " Lipoma.
- 1 " Glandular.

The analyses of Aviolat and Walsh contained, in the one, a total of 48 cases, with 22 encephaloid, 7 scirrhus

and 15 mixed; and in the other, 58 cases, with 38 encephaloid, 9 scirrhous, and 5 mixed. But a good many lymphomas or Sarcomas were, no doubt, included among these, and the only safe conclusion to be drawn from them is, that encephaloid cancer, of the old type, nearly equals in frequency all the other forms put together.

It is impossible in most of the cases to fix upon the exact point of origin of these tumours, owing to the general implication of organs in their vicinity when they have become at all large. The situation of them, surrounded as they are by vital organs, makes them doubly destructive, and even an innocent tumour at the root of the lungs, may become, if large, a source of great danger. A tumour in the mediastinum or at the root of the lungs, as it increases in size, presses upon, pushes aside, or invades and destroys, the large air-tubes, the heart and blood-vessels, the oesophagus, the nerves, the walls of the chest, etc. And sometimes its progress and direction of growth can be made out during life, by carefully noting the succession of symptoms that arise in the course of the illness. Although the lungs may sometimes be infiltrated with nodular, cancerous masses, and little change take place in the intervening substance, they are, nevertheless, when a main bronchus is constricted, for instance, sometimes found collapsed after death. Sometimes, also, they are the seat of inflammatory changes, and ^{are} occasionally, ulcerated and gangrenous. The

Signs and symptoms arising in the course of these various secondary changes, help us in our diagnosis -

The implicated lung was found post mortem, to be pneumonic in 6 of our 33 cases - in the grey hepatization stage in 2 - and the opposite lung was congested in 6. It was collapsed partially or completely in 9, and presented appearances of bronchitis in 3. There were 6 in which cavities existed, 2 from softening of the tumour-growths, and 4 from destruction of lung tissue, - two of the latter being in cases of scirrhus. And in one case tubercle co-existed with the cancer. In one of the two cases in which a cavity resulted from the softening of the tumour, this took place only after death, but in the other (Case 26) the cavity was diagnosed during life.

There is nothing recorded in any of the cases, to show that in those in which inflammation of the lung occurred, there was special development of the growths towards the sympathetic plexus of nerves, and so, by pressure upon, or destruction of, them (as suggested by Dr. Budd), inflammatory processes were set up - yet this may have been the case.

Pressure upon the bronchi, resulting in great accumulation of mucous-purulent matter within them beyond the point of constriction, seemed to be one cause, at least, of subsequent inflammatory changes. And emphysema was in one instance, undoubtedly a consequence of outside pressure upon the bronchi. This case was under the care of Dr. J. Pearson Irvine, and in his description of it, he remarks

1. *Lancet* Vol. I, 1876, page 415 -

that the lungs were both affected with Emphysema, and the right, though collapsed, was capable of inflation after death, and still showed the Emphysematous condition. During life this might have been a source of difficulty in diagnosis, by obscuring percussion dulness over the seat of disease, but the tumour extended upwards into the neck, and thus, rendered its presence visible. In all instances where the lung was collapsed, the bronchus leading to it was compressed and greatly narrowed, if not entirely obliterated by the new-growth. Gangrene, when it exists, is probably due to pressure upon the nutrient vessels of the lung. Pleurisy existed in 18 of our cases; one side was affected in 11, both sides in 7, and there was considerable effusion, sometimes rather sanguineous, in 8 of them.

The heart and large blood-vessels connected with it, are very liable to be involved by tumour growths arising within the chest, and from the well-marked physical signs which interference with these organs produces, a careful study of the subject is necessary. In the cases under discussion, the pericardium was affected in 22 of them, and this in 20 cases by direct irritation, the inflammatory process being, evidently, set up by contiguity of the growth. In 4 cases only effusion into the sac is mentioned, and in all, the cause of it most probably was, active inflammation, and not blood-stasis from pressure on the veins, as is suggested by Hertz in Zimmereus's Cyclopaedia, Vol. V, p. 449.

In Case 31, the pericardium contained several isolated tumours. The muscular walls of the heart were invaded by growths in 10 cases; the left ventricle, in 1; the left auricle, in 3; the right auricle, in 2; both auricles, in 2; and in 2, the part affected is not stated. The tumour in several cases projected quite into the interior of an auricle and filled it up (example, Case 11), the endocardium, however, being generally traceable over the surface of it. Case 16, of our list, reported by Dr Clapton, is one of the most remarkable of these cases. It was a lymphadenomatous tumour arising within the mediastinum, and had apparently, extended through the small veins into the superior vena cava, and thence to the right auricle. It appeared as a spherical mass which nearly filled this chamber, and bulged somewhat through the auriculo-ventricular orifice. The prolongations of it extended upwards into the superior vena cava and its branches, to a distance of four or five inches, and occupied and distended them. Cases, 19, 24, and 31, illustrate this still farther. But, sometimes, a mediastinal tumour will pass downwards, extending both in front of and behind, the heart, and yet not involve its muscular walls. One such case is reported by Dr S. West (25). The heart, he states, was pressed upon and pushed down towards the diaphragm, and though it passed under the pericardium, the muscular wall of the organ escaped.

According to the point of origin of the tumour, and the direction in which it spreads, the veins and arteries

Are variously interfered with - The aorta and large arteries were compressed in 11 of our collected cases, but only 5 are mentioned as being invaded by the growth - In Case 18, a sarcomatous tumour, as large as an orange, was found investing the descending thoracic aorta, and another surrounded a branch of the left pulmonary artery - they were believed by Dr. Dreschfield, who reported the case, to have grown from the adventitia of the blood-vessels. In another case, a cancerous nodule arose on a branch of the coronary artery (30). Any part of the aorta may be implicated - frequently it is the arch, and then the innominate, the carotid, and the left subclavian, may be involved - The arteries, however, seem to offer greater resistance to the encroachments of these growths than the veins do, and there is no case in the list where a large artery is reported to have been obliterated.

In 10 of the cases, the large veins were surrounded and pressed upon, in varying degrees up to total obliteration. It is not mentioned in many, whether the walls of the veins were invaded by the growth or not, but it appears that sometimes both coats are involved and broken through, though generally the internal coat remains intact. The thinness of the walls of veins permits compression to take place readily, and this may save their coats for a time, but eventually, in a good many, the internal coat also gives way, the tumour projects into the vessels, and thrombi are formed in them through retardation of the flow of blood.

This may happen also, without rupture of the internal coat. In 2 cases complete occlusion is reported, and it was the Superior vena cava in both. The Superior vena cava was involved 6 times, the inferior vena cava once, and the pulmonary veins 3 times. These cases have certain well-marked symptoms during life which greatly helps in diagnosis, and the following instances may be quoted:— In Case 17, the Superior vena cava was found to be narrowed by a growth, and the left innominate vein almost obliterated; the right internal jugular was about twice the size of the left, and the right anterior jugular, as big as an ordinary internal jugular. During life in this case, the enlargement of the anterior jugular and its tributaries were visible, the lips were livid, and there was interruption of speech from dyspnoea. In case 19, the superior cava was almost occluded very near the right auricle: the face and eyelids during life were oedematous, the lips livid, and both external jugulars distended; these appearances gradually became worse, and three weeks before death, a superficial mammary vein was seen to anastomose below, with a superficial epigastric vein. At the same time, there was some haemoptysis and blood-tinged expectoration, which was thought to be due to engorgement of the bronchial veins and capillaries— the bronchial veins being tributaries of the Superior vena cava, through the vena azygos and left Superior intercostal vein. The course of the blood in any irregular anastomoses of veins, can be made out by tying

a string round the body, and watching the filling or emptying of them, above and below the constriction. Serous fluid often escapes from the veins when they are distended, by pressure occurring at some point in their course, and oedema is the result. This was exemplified in Case 19, and others.

The innominate, subclavian, and jugular veins may become distended, when the flow is interrupted through the Superior vena cava; and should complete constriction in this vessel take place, above the point at which it is entered by the vena azygos major, collateral circulation may be established between the latter, and the jugular and subclavian, through the intercostal veins on both sides. And even the left innominate vein and the greater azygos vein may communicate, through the left superior intercostal, and lesser azygos veins — these last-named, deep-seated vessels then becoming very much enlarged.

In cases where the Superior vena cava is constricted, the distended tributaries of it shew themselves in the upper part of the chest, ^{and neck,} but when the inferior vena cava suffers from pressure, it is the veins of the abdomen that become most prominent. The former is of most frequent occurrence, however.

The nerves within the chest, also, may be pressed upon and disorganised, and various important symptoms thereby result. Pain may be produced by pressure upon the internal thoracic and intercostal nerves, or even upon the brachial plexus, but, pressure upon the pneumogastric,

recurrent laryngeal, or phrenic nerves, produces some of the most marked results. In 8 of our cases the involvement of nerves is related:— In 4 it was the left vagus only, in 1, the right vagus, in 1, both right and left, and in 2, the left recurrent laryngeal. In 2 cases the left recurrent laryngeal was involved along with the left vagus, and in 2, both recurrents were involved together, but the right recurrent laryngeal, never alone. There seemed to be thickening of the nerve-trunk in many of these cases, through infiltration of the tumour-tissue — this is specially stated in Case 25 — but sometimes the thickening may be due to inflammation of the nerve. In Case 13, the right recurrent laryngeal was given off within the tumour, and the left was adherent to the surface of it. In Case 17 the inferior cervical ganglion was also imbedded in the tumour, but not compressed by it. Otherwise, the sympathetic nerves and ganglia, though they must in almost every case, have been implicated, are not mentioned.

In 5 cases it is mentioned that the œsophagus was pressed upon and pinched, and in 2, its wall was beginning to slough. The trachea also, in Case 9, was ulcerated. But the thoracic duct, which from its situation, could hardly escape being implicated, is not mentioned at all.

Signs and Symptoms. There is no special sign, by which we can detect during life primary cancerous disease within the chest, the indications all being common to

other chest affections; and in a large proportion of the cases which have occurred, and even, attracted special attention, their nature has been, not merely left in doubt, but positively mistaken - In those forms of cancer, resembling in their size and wide distribution throughout the lung, military tuberculosis, it may be impossible to distinguish between the one disease and the other, as the effects produced are often identical - In some cases, indeed, there is less inflammatory change produced for a long while, in the lung-substance surrounding the cancerous deposits, than is usual in tubercle; and from the absence of physical signs of irritation and of general constitutional disturbance, in such cases, the difficulty of detection is very great - Still, there are what might be considered typical cases of this class of disease - Chiefly those where the cancerous masses are large - in which a grouping of symptoms takes place, that will pretty surely lead to diagnosis -

In cases of general cancerous infiltration of the lung, even when combined with a certain slight degree of nodular formation, the physical appearances etc., are different in some respects, from those in which the growths are larger - In the former there may be retraction of the affected side, diminished movements, increased vocal fremitus, and depression of the intercostal spaces; in the latter, general expansion, or bulging of the chest, movements completely lost, vocal fremitus diminished or lost, and the

intercostal spaces, widened and flat, or bulging - In the former also, dulness of a wooden character may be elicited on percussion, and a bronchial, or a weak respiratory, murmur, be heard on auscultation - this depending upon the degree of constriction of the bronchi - likewise a loud ringing, a healthy, or an inaudible vocal resonance.

The larger the tumour the more likely is it to be detected, and those in the mediastinum are the ones that have generally been made out during life.

Particular symptoms arising in the course of the Cases under review.

Pain - Although some degree of pain is probably felt at times in most cases of malignant chest affection, a few are reported as having run a painless course to the end, and it is only mentioned as a prominent symptom in about half the number - It may be circumscribed in the region of the diseased organ, and of a dull, aching character, or it may extend to parts remote from the disease - The arm and chest of the affected side are most frequently the seat of it, but it may extend to the abdomen and down the leg, or up the neck to the head, and across to the opposite side, and may then be lancinating, radiating, and intermittent in character - Accompanying this, very frequently, there arises an acute sensibility of the skin - Pressure upon the nerves in the vicinity of the tumour will explain most of this - In case 31, there was an aching pain in the epigastrium and at the lower part of the sternum, which had lasted for

three years; in Case 24, great pain was excited in the abdomen and back, whilst lying on the left side, so that the patient lay on the right, and only varied that position to crouch on his knees and elbows, during severe attacks of dyspnoea. Pain is sometimes felt on taking a deep inspiration, and is increased by cough or movement.

Cough. This is a symptom of very frequent occurrence, and is often of a hacking, shrill, brassy, and paroxysmal character, increasing generally towards the last. It is probably the result in some cases, of direct pressure by the growth, upon the bronchial and other nerves, but it is also, evidently, a symptom of intercurrent affections like pleurisy, and bronchial catarrh.

It occurred in 2 cases, and was a distressing symptom in that of C.S. Pressure upon the phrenic nerve, as it passed through the tumour behind the left ventricle, probably gave rise to it in this case; but in the other, Case 24, it was through extension of the disease from the right lung to the diaphragm and liver.

Expectoration. In most of the cases, though not in all, there is some degree of expectoration noted; and of that which is tinged with blood, the quantity and character varies a good deal. It may be copious or scanty, is usually frothy-white, and rarely mucous or muco-purulent. Blood-spitting is reported in 18 cases, generally appearing in small quantity at a time, but occasionally

amounting to a couple of ounces in the twenty-four hours. In some it was the first symptom observed, and was mostly bright red in colour. Sometimes it appeared in the form of small coagula, and was described as being "in lumps," in Case 31. In this case the hæmoptysis occurred after severe coughing, but there was no expectoration. This was remarkable, for the post mortem examination revealed ragged cavities in the centre of the lung, filled with yellow, curdy pus. Dr Finlay who reported the case, stated that the cause of this was two-fold: (a). The left lung and chest wall had lost their elasticity, and the muscles were so feeble, that no expulsive effect was produced on coughing. (b). The new-growth occluded the bronchi, and left no passage.

In none of our cases was the expectoration stated to have been fatal, but such has been noted by others, in certain cases of intra-thoracic cancer, and particularly, when there was a gangrenous state of the lung.

In 4 cases there existed the currant-jelly appearance of the sputa, to which as a diagnostic sign, so much importance has been attached by Hughes, Stokes and the older writers. It was of the pink variety in 3, and of the dark-red in 1. This appearance is due to the mixing together of pus and blood, and in Case 30, it was examined microscopically, and found to consist of leucocytes, epithelioid cells, and red blood corpuscles. When it does occur it is, no doubt, an important sign, but it might con-

ceivably arise in other diseases as well, in which suppuration took place. The sputa was examined only in a few cases, but cancer-cells were not discovered in any of them.

Dyspnoea. In some of the cases recorded this symptom was most severe. It increased as a rule towards the end of life, and was generally constant when it did commence, but liable to recurring paroxysms of great severity. Case 4 exhibited this symptom, which was described as being of the inspiratory type. In case 24 the patient sought relief by bending the body forwards, and supporting himself on hands and knees; and death resulted during a severe attack, in case 25. The cause of this symptom is, in most cases, pressure. This may be exerted by the growth itself upon the air-tubes, arteries, veins, or nerves, singly or in combination; also by accumulations of fluid in the pleura or pericardium; and lastly, it may be caused by inflammation or destruction of the lung substance.

Dysphagia. This symptom is of less frequent occurrence than might have been expected, from its relation to the left bronchus and other structures from which cancerous growths may arise. The patient feels as if the food were stopped at the level of the sternal notch, and it is then usually vomited. When ulceration of the oesophagus takes place, sometimes dark-coloured blood appears in the vomited matters, and this happened in case 15.

Loss of voice. Hoarseness, feebleness, or complete loss of

voice may accompany intra-thoracic cancer. It occurs in about one-third of the cases, and is most frequently due to pressure upon the recurrent laryngeal nerves - the left one more particularly, owing both to the left lung being ^{probably} more frequently affected than the right, and to the nerve itself having a longer course than the right recurrent, within the thorax. Examination by the laryngoscope in such cases, often brings to light, a vocal cord, flaccid and motionless from paralysis. Cases in point are, 2, 3, and 35.

Physical Signs.

Inspection. The sallow, cachectic appearance of the face, so common an accompaniment of cancer in general, is not often seen in this class of the disease - At the beginning of it the patient may be fairly well nourished and have a clear complexion, but as it progresses, emaciation, paleness, and a sad, anxious expression very frequently appear. The pupils may be unequally dilated from pressure upon the sympathetic trunks and ganglia in the upper part of the chest, but this only happened in two of the cases of our collection, namely, 29 and 31, and in both it was the left pupil, and dilatation occurred. Another symptom associated with this aetiologically, is unilateral sweating which, however, is not reported as occurring in any of the 33 cases. Puffiness of the face, neck, chest and arms from oedema is rather common, and along with this may exist a livid look, especially in the lips and about the eyes - This may have been preceded by flushing of the

face - Dilatation of the veins on the chest, neck and arms more particularly, may occur either alone, or accompanying the oedema, and sometimes, late in the case, pulsation may be seen in those in the neck. This happened in Case 21, and during the last fortnight of life, two superficial veins on the right side - the external jugular and a thyroid vein - were observed to pulsate at each beat of the heart, but it ceased when the patient sat up. Post mortem, a mass of enlarged lymphatic glands were found, which passed between the ascending aorta and the right brachiocephalic vein, and the interposed mass communicated from the one to the other, the impulse which was shewn in the tributaries of the latter. Dr Cockle records a similar case - no. 2 in his treatise, page 114. The veins may also shew anastomoses, as in Case 19, where a superficial mammary, united below with a superficial epigastric vein; and sometimes, where there is bulging of the chest wall from an underlying tumour, the veins may be distended and tortuous, or form a prominent plexus as they course over it. This occurs at the back as well as in the front of the chest.

Alterations in the shape and movements of the chest may also be visible. In some of the cases with large tumours, distinct bulging may be observed, and the growth itself may extend from within, and implicate the bony walls and the pectoral and intercostal muscles. The intercostal spaces may likewise be altered. As the growth within expands from increasing size, the spaces between the ribs

may be widened, and a flattening greater than natural, take place. This helps in distinguishing between tumour and pleurisy, and is frequently seen in cases of mediastinal tumour. Enlarged glands, attached to their surroundings, appear also, in the neck; in the axilla; or at the articulations of the jaw, as in Case 1. The chest may be flattened in places, especially under the clavicles, whilst it bulges in others - Measurement usually shows an increase of size on the affected side. In Case 26 it measured $18\frac{1}{2}$ inches, and the unaffected, 17 inches: Case 31, also, at the level of the 4th rib measured $16\frac{1}{2}$ inches on the affected side, and $15\frac{1}{4}$ inches on the other - Occasionally this may be reversed, however, as in the case of C.S., where the diseased side, though the seat of a large nodular growth, was found to be a quarter of an inch smaller - but this may have been due to compensatory expansion of the lung on the healthy side, rather than to retraction on the other. Prominence in the right hypochondrium may take place from pushing downwards of the liver (Case 26), or, as in Case 24, from secondary deposit in that organ, which may be seen and felt. Displacement of the apex-beat from its normal site, and tumultuous action of the heart, not infrequently take place, and the affected side may be retarded in movement, and even fixed as in Case 19.

Palpation. In the beginning of the disease the vocal fremitus may be increased, owing to condensation of the lung tissue without interference with the calibre

of the tubes, but in the later stages, it is generally stated to be impaired or altogether absent, and this, no doubt, is due to occlusion of the bronchi by the invasion of the new-growth, or, to blocking up with secretions. Inter-current pleural effusion also may be a cause of its absence. Displacement of the apex-beat, or its absence in the course of pericarditis, may also be made out by palpation; and there may be inequality of the pulse at the two wrists. When any of the large vessels coming off from the aorta, or the aorta itself, is pressed upon, the pulse on the side affected may become imperceptible. This symptom is not very common, but it was noted in case 25 as occurring the day before death. The pulse is generally weak, very compressible, and frequent, - from 100 to 120 beats per minute.

Percussion. - In the early stages of the disease percussion gives very little information. It is only when growths arising at the root of the lungs, have become large, and have reached the chest wall, that dulness results from their mere presence. It exists then most frequently, either in front, or, in the interscapular region on one side. But the pneumonia and pleurisy, which may be set up by the growths while they are still small, give rise to dulness, localized at first probably, but eventually extending to the whole side of the chest. A peculiar sense of resistance, greater than that in ordinary pneumonia or pleurisy, has been frequently remarked, and this attracted the attention of Wilson Fox in the case of C.S.

In pleurisy the dulness^{is} generally progressive from below upwards, if the case be watched from day to day. Emphysema, which occasionally results from constricted bronchi in the course of these affections, may obscure the dulness, as in Case 11.

Over those tumours which develop in the mediastinum there may be a small area of dulness, about either sternoclavicular articulation, at first, and this spreads in all directions, until it merges with the cardiac dulness. Generally, the lung at the outer boundaries of this patch, remains resonant. The spreading over gradually and continuously, of the dulness to the opposite margin of the sternum, and resonance remaining at the acromial angle, would distinguish it from the dulness in tubercle (Case 4). Alteration of the physical signs may take place suddenly from softening and cavity-formation, as in Case 26.

Auscultation. As little can be made out by auscultation in some cases as by percussion. Where the disease increases without inducing much inflammatory change, the respiratory murmur has a weak, harsh, or blowing character, it becomes feeble over the growth, and the expiration is prolonged. The vocal resonance, also, is very clear at first, but afterwards, is diminished or absent. When pneumonia or bronchitis is set up, the physical signs of these conditions are present. Fine crepitations, in patches at first, resembling lobular pneumonia, may be detected, but these spread eventually to an entire lobe or to the whole

lung. At one stage of this pneumonic state, if obliteration of the bronchi be not an early feature, the case, to one examining it for the first time, may resemble chronic fibroid change. Some degree of bronchial irritation may accompany the pneumonic condition, and numerous rales of coarse quality, be occasionally heard. Friction sounds may be heard or not in the course of intercurrent pleurisy, and even when effusion results it is difficult in many cases to detect them. The signs connected with cardiac interference, may be most important; murmurs from pressure, friction sounds from pericarditis, increased impulse, irregular action from pressure upon the sympathetic and vagus, and displacements — also murmurs from pressure upon the large vessels, will help towards a diagnosis, but at the same time they will suggest other affections, such as aneurism. After softening of the cancerous growths, when such takes place, and the softened material has been got rid of, cavities may be formed which will change quite suddenly the auscultatory signs. And destruction of the lung tissue may give rise to similar phenomena. The frequency of the respirations is not often noted in the records of cases, but in that of C.S. it was remarkable for its slowness — for many days it was only 11 per minute, and was obscured by hiccough, but at the last it rose to 30.

Temperature. The temperature is mentioned only in about half the cases here collected, but in those that it is

did rise above the normal, nothing of a characteristic nature was manifested. The highest temperature recorded among them, in the ordinary course of the disease, is, 102°F , and this is the maximum. The minimum daily temperature was frequently below the normal, and occurred, generally, in the morning. Perspiration, accordingly, is not a common symptom, but it does occur profusely in some cases, and may be unilat-
 eral. High temperature and free perspiration are probably induced in most cases, by the intercurrent inflammations. One case reported by Risdon Bennett, however, led to the belief that increase of temperature arose from rapid cell formation - this was in a case of primary cancerous disease in the testis, and Secondary in both lungs, liver, etc.

Among the general symptoms that may arise, is one which seems to be of rather frequent occurrence, and that is, great mental depression. In some cases the brain may be the seat of similar growths to those in the chest, but in others the mental phenomena occur independently. Derangements of the digestive organs also, frequently accompany the disease, and should the liver be implicated by secondary growth, there may be jaundice extending to the conjunctiva. When the yellowish, earthy look of cancer exists, with no liver complication, the conjunctiva remains white.

The succession of the various signs and

Symptoms already enumerated, may often enable us to localise the tumour-growth among the structures within the chest. In Case 2, for example, the first symptoms to attract attention were those from pressure on the trachea and oesophagus; then came loss of voice from pressure about the aorta, involving the left recurrent laryngeal nerve; and finally, venous engorgement, from pressure upon the large venous trunks—showing that the disease in this case, arose in the posterior mediastinum and gradually spread forwards.

Etiology. Inherited tendency does not shew itself in so marked a degree in Cancer, as it does in many other diseases, like gout and rheumatism. In no single case in the present collection was there a history of cancer traceable in the parents or other near relatives. In the majority of cases, indeed, the family history was good: in 3 only, is it stated that the parents had consumption, and it was the father in all—but this is hardly sufficient for us to connect together the two diseases in the relation of cause and effect. In most of the cases themselves, too, a good previous history was given: in 3, scarlet fever is mentioned among the earlier illnesses—but as scarlet fever is a disease of such common occurrence, little importance can be attached to it in this connexion. Active employment was in most cases continued by the patient, up to the time at which definite symptoms appeared

And he sought advice.

As to the constitutional state which leads up to cancer, nothing yet appears to be known — it would be impossible to predict with certainty its occurrence in any given case — but when the mischief has once begun, we may from analogy form some conception of its probable course, the process being akin to what we understand as a hyperplasia. In its simplest forms, however, hyperplasia is a physiological process rather than a pathological one; but in the rapid cellular reproduction which occurs in cancer, we have a process which pursues an uninterrupted course of destruction, and is the reverse of physiological. It has in its later stages, indeed, all the evil attributes of a parasite; and in its power of infecting distant organs, even its parts shew independent life. In cancer and allied growths, the histological elements are of the simplest kind, having their type in the embryonic tissues; and like all such lowly-differentiated forms they shew great tenacity of life and power of reproduction. It is only in outward, visible characters, however, that the cellular elements of cancer resemble embryonic tissue; in their functions and ultimate destiny they are very different. The process of nutrition in its simplest state merely maintains the level of its normal condition; in cancer reproduction is in excess. But the conditions and circumstances which give rise to

this morbid process, are, as far as is known at present, involved in mystery.

Diagnosis. Various points connected with the diagnosis of intra-thoracic malignant growths, from other diseases that resemble them during life, have already been alluded to; but to treat the subject in a more special manner, a few of the chief characteristics of these diseases may be given in detail. The diseases most likely to be mistaken for cancerous growths are chiefly, Aneurism, Chronic pleurisy, phthisis, Chronic pneumonia, enlargement of the bronchial or mediastinal glands (possibly leading to abscess-formation), enlargement of the thymus or thyroid glands, Syphilitic tumours beneath the sternum, and cysts, simple or hydatid.

To distinguish between aneurism and cancer of the lung is sometimes a most difficult task. We may have in aneurism, dulness on percussion over the site of the main blood-vessels, altered respiratory sounds, diffused pulsation, unequal pulses at the wrist, and a want of synchronicity in them, a hoarse voice, and unequal pupils from pressure upon the nerves, also dysphagia and paroxysmal dyspnoea, very like what occurs in cancer, so that general signs and considerations must be more or less relied upon for the diagnosis. These are, the history of the case, the less extensive area of dulness in aneurism usually, the absence of tumour growths elsewhere, the absence of local venous engorgement,

the presence of the characteristic thrill and bruit, and the evidences of disease in the blood-vessels.

The next disease, and the one which seems to have offered the greatest difficulty to physicians, is Chronic pleurisy. To make out the existence of this, however, does not finish the diagnosis always, for it is shown above, that malignant growths and pleurisy often co-exist; and the absence of it on the other hand, when we can be sure of such a thing, does not help us much in the matter either. Still it is a necessary step in the complete diagnosis of a case, to detect pleurisy if it be there, and an exploratory puncture often becomes necessary to test the existence of effusion. One puncture may be insufficient, for it has frequently happened that a second or a third, each at a different point, has been successful in drawing off fluid when the first has failed. The operation should be performed with a large-sized needle. If the needle should be grasped by the tumour-mass, or better still, if some of the elements of the mass should be drawn away by it, important information might thus be given. One ought, however, to bear in mind the possible existence of a greatly-thickened pleura — but a careful microscopic examination of the matters drawn off, would generally decide the question. Sanguineous effusion would point to the existence of malignant tumour.

Cancerous disease has been mistaken for phthisis, but the usual occurrence of the latter affection at the

apex instead of at the root of the lung would help to decide; the flattening, too, of the chest wall, the mucous rales, and later on, the signs of a cavity, together with the hectic symptoms etc. would be important indications of phthisical disease.

Ordinary acute pneumonia shews rusty sputa, crep-
itant rhonchi, and high fever, which are not characteristic
of cancer, and with care a mistake ought not to occur
between the two. But in chronic pneumonia the dif-
ficulties might be very great. The chief points to remem-
ber in this affection are:— diminution of bulk of the af-
fected side of the chest; the wide-spread dulness on per-
cussion; the non-extension of it to the opposite side for
a short distance only beyond the median line; the per-
sistence of vocal fremitus; its longer course, with well-
marked emaciation from the early stages of it; and
the less pronounced attacks of dyspnoea.

In mediastinal abscess, the history of the case,
scrofulous glands, high fever, etc., before it pointed or
discharged, would help to decide.

Iodide of potassium administered where sylphitic
growths were suspected, would clear up the matter by
dispersing the tumour probably. And where cysts ex-
isted, their contents, should they be expectorated, would
decide in favour of them.

Prognosis. As all the cases which have been
diagnosed with any degree of certainty, have proved
fatal, the prognosis of these intra-thoracic tumours,

even of the less malignant kind, is most unfavourable.

The duration of the disease varies a good deal.

Among our cases, when it did start, it usually ran its course in about six months. Some were as long as a year, but many more were under three months. By the course of the disease as here meant the period dating from the first symptomatic indication of it, till death; and no distinction is made between the malignant tumours of the connective-tissue group, and those of the Epithelial. Case 10 ran its course in 11 weeks, and was under observation only 17 days. Case 7 was even shorter - the patient being quite well two months before death. In case 5, symptoms were noticed for the first time after training for a rowing match, and death occurred 15 weeks afterwards. But the most remarkable case in this respect, was that of Jaccoud's, quoted by Hertz. "In it, death took place, eight days after ^{the} development of subjective symptoms - probably the shortest course on record.

Treatment. Before we can hope to prevent cancer by any rational mode of medical treatment (and it is in the way of prevention that our hopes seem chiefly to lie), physiology must first supply us with many facts yet unknown, connected with normal growth and development. The same knowledge is required, before we are likely to be able to cope with the disease when it has arisen, and as surgical interference is out of the question

our treatment must, at present, be mainly directed against any troublesome symptoms that arise. Among these may be mentioned simple pain, cough, dyspnea, and dysphagia - Opiates and other kindred remedies will be found of great avail, and liniments of a soothing nature, such as acouite and belladonna, may also be employed - Counter-irritants also, like mustard plasters, blisters etc. may be called for, to relieve dyspnea; and even paracentesis, for the removal of pleuritic or pericardial effusion, may be required. The patient's strength should be sustained by rest, tonics, and nutritious food, and as there is often a disinclination to eat, food should be brought at regular intervals whether the patient desires it or not. If dysphagia exists to any great degree nutritive enemata may have to be given. But to counteract the main disease, we must in humility, admit, that there has not yet been found a remedy -

A numbered list of Thirty-two cases reported in the Periodicals,
and one of our own -

1. C.S.

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| 2. (Yeo) <i>Lancet</i> , Vol. II, 1876, p. 707. | 18. (Dreschfield) <i>Lancet</i> , Vol. I, 1878, p. 536. |
| 3. (Whipham) " " II " p. 911. | 19. (Johnson) " " I, 1878, p. 707. |
| 4. (Fox) " " II 1878, p. 577. | 20. (Tizard) " " " " |
| 5. (Ward) " " I, 1867, p. 238. | 21. (Johnson) " " " " |
| 6. " " " " | 22. (Fenwick) " " I, 1882, p. 647. |
| 7. (Clarke) " " II, 1872, p. 10. | 23. (Davy) " " II, 1882, p. 257. |
| 8. (Powell) " " II, 1872 p. 886. | 24. (Drummond) " " p. 651. |
| 9. (Williams) " " " " | 25. (West) " " (Path. Soc.). |
| 10. (Hall) " " I, 1880, p. 493. | 26. (Suckling) " " II, 1884, p. 1047. |
| 11. (N. Moore) " " I, 1880 (Path. Soc.). | 27. (Hilary) <i>Med. Times</i> , I, 1885, p. 145. |
| 12. (Porter) <i>Brit. Med. Jour.</i> II, 1885, p. 448. | 28. (Barton) " " II, 1880, p. 266. |
| 13. (Charteris) <i>Lancet</i> Vol. I, 1874, p. 126. | 29. (Andrew) " " I, 1876, p. 359. |
| 14. (Coats) " " " " p. 353. | 30. (Woodman) " " I, 1876, p. 411. |
| 15. (Charteris) " " III 1874, p. 583. | 31. (Williams) <i>Lancet</i> , Vol. I, 1886, p. 545. |
| 16. (Clapton) " " II, 1874, p. 853. | 32. (West) " " I, 1884, p. 847. |
| 17. (Erwine) " " I, 1878, p. 415. | 33. " " " " " " |

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