A Post-graduate Lecture ON THORACIC ANEURYSM.

DELIVERED AT THE MEDICAL GRADUATES' COLLEGE
AND POLYCLINIC.

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THROUGHOUT the country it is recognized that certain diseases are more prevalent in some parts than others, and in some instances this is so pronounced that special districts may be said to be the home of certain diseases. In this sense there can be no doubt that the district of Tyneside (including neighbouring seaports), of which Newcastle may be said to be the centre, is linked with thoracic aneurysm. So numerous are our cases that it is not uncommon to find five or six examples in the wards of the Newcastle Royal Victoria Infirmary at the same time. It is remarkable, however, that this applies only to aneurysm affecting the thoracic aorta, for those of the abdominal aorta are rare, whilst surgical aneurysms in the shape of axillary, brachial, popliteal, etc., are distinctly uncommon in the district.

ETIOLOGY.

The reasons for this afford an interesting subject of inquiry, but time and the scope of the present lecture will not admit of more than this passing reference.

It has often been maintained that strain from heavy and laborious occupations is the chief factor in the causation of thoracic aneurysm, and so general is the professional opinion that aortic strain is the predominating factor in the causation of aneurysm, that when the fact of this prevalence in the Newcastle district is mentioned to medical friends from a distance, it naturally invites the inquiry: "Does not the nature of your industries supply the explanation?" That this is not all is certain; and that it may be true only to a very limited extent can be shown from our own cases. A careful examination of upwards of 300 examples has convinced me that this view is incorrect. For instance, out of a group of 145 cases in which the point was specially noted, 64 only had been engaged in heavy employment; in 81, including 14 women, the action of strain could be eliminated.

The question of the relation between syphilis and aneurysm has exercised the minds of clinical observers for many years, but apparently without resulting in a definite conclusion beyond the general impression that they are closely connected. It is a question that for obvious reasons cannot be settled by statistics, though they are naturally helpful. My own inquiry in this direction shows a history of syphilis in 102 out of 145 cases. In my opinion aneurysm of the thoracic aorta is undoubtedly a syphilitic disease, though aortic strain from hard work where the tissues are already degenerated by alcoholic excesses must certainly predispose. I may say in passing that in more than 40 per cent. a strong alcoholic history has been obtained.

ANATOMY AND PHYSIOLOGY.

The aorta arises from the left ventricle about $\frac{1}{2}$ in. behind the sternum, at a point about the level of the lower border of the third costal cartilage, somewhat to the left of the midsternal line. Thence it passes upwards, forwards and to the right to the level of the upper border of the second right costal cartilage, from which point it passes backwards diagonally towards the left, rising still further until it reaches a point about 1 in. below the upper border of the sternum. It eventually touches the left side of the lower border of the fourth dorsal vertebra, whence it descends. At its origin it is about $1\frac{1}{2}$ in. in diameter, expanding some 2 in. further on into the great aortic sinus, and contracting again just beyond the left subclavian artery into the so-called isthmus, and once more expanding into the spindle. At the junction between these last two parts there is a point, sometimes termed "the angle," which is a very common seat of disease. Anatomists divide the vessel into the ascending, transverse, and descending portions; but it has been my

custom to speak of the ascending, ascending transverse, transverse, transverse-descending, and descending, and there are clinical reasons for this further subdivision. I must content myself with a very brief statement of the relations of the arch, though I cannot insist too strongly upon their importance from the point of view of the diagnosis of aortic aneurysm.

The ascending arch has at its root immediately in front the right auricular appendix and the pulmonary artery, whilst behind and to the left is the left auricle, and these structures envelop it for nearly $\frac{3}{4}$ in., whilst the pericardium covers it for rather more than 2 in., reaching up to a point close to the innominate artery. Behind the ascending arch is the right branch of the pulmonary artery and the right bronchus, and to its right the superior vena cava, while the right lung and pleura practically surround the vessel in front, to right and behind. The important relations of the transverse arch are: in front, the lungs, pleura, and sternum; above, the left innominate vein and the vessels that spring from the aorta; behind, the deep cardiac plexus and trachea at its bifurcation, the oesophagus, and thoracic duct; beneath, the left bronchus, superficial cardiac plexus, and pulmonary artery; whilst the vagus and phrenic nerves pass in front, towards the left side, and the recurrent laryngeal winds round beneath and behind the vessel opposite the left subclavian. The descending arch is related to the oesophagus and vertebral column.

The nervous supply of the arch has not, unfortunately, been well worked out by anatomists, and though a point of the greatest importance in connexion with the symptoms and diagnosis of aneurysm, it is not possible to make more than a brief problematical statement in respect to it. Anatomists tell us that the aorta receives sympathetic fibres from the cardiac plexuses, and suggest that the chief supply is from the superficial cardiac plexus, a point of importance when the distribution of the pain in connexion with thoracic aneurysm is considered. The cardiac plexuses are two in number, the deep and the superficial, the former receiving branches from the right superior cervical ganglion and the middle and inferior ganglia on both sides, whilst the superficial cardiac plexus, though in communication with the deep, is derived chiefly from the left superior cervical ganglion. In addition to the sympathetic nerves that pass from these plexuses to the aorta, the vessel below the arch is surrounded by an aortic plexus which is formed by branches from the upper thoracic ganglia, and communications from the posterior pulmonary plexus and cardiac plexus. On the other hand, it must not be forgotten that the cervical and thoracic ganglia are intimately connected with the spinal nerves; thus irritation arising in the aortic wall may be reflected peripherally to the distribution of spinal nerves in chest, shoulders, arms, back of head, neck, etc. We thus account for the patient's complaint of pain in aneurysm. Clinically, one is tempted to connect definite parts of the aortic arch with certain sympathetic levels having definite spinal connexions, and it may yet be proved that such connexions exist, but anatomists have so far failed to establish them. This point, however, I shall hope to make clear when dealing with the symptom of pain. The dilator pupillae is supplied by the sympathetic fibres, which take their origin from the cells of the superior cervical ganglion. The white rami fibres associated with these leave the spinal cord by the motor roots of the first two or three thoracic nerves, and ascend the sympathetic trunk to the superior cervical ganglion without interruption.

VARIETIES OF ANEURYSM.

I hoped to be able to deal with the morbid anatomy and pathology of aneurysm, but fear I must confine myself to a brief statement dealing with the varieties of aneurysm and the portion of the vessel affected. For this purpose a group of 225 cases, verified by *post mortem* examination, has been selected. Of these, 179 were sacculated, 39 fusiform, and 7 dissecting; a statement which perhaps may be said to under-estimate the true relative proportion of fusiform to sacculated.

The 179 sacculated aneurysms were distributed as follows over the various parts of the arch: 60 in the ascending, 13 ascending-transverse, 57 transverse, 19 transverse-descending, and 30 descending; or, to make the statement in conformity with the usual division of the

arch into three parts—namely, ascending, transverse, and descending—73 belonged to the first, 76 to the second, and 30 to the third; and, taking into consideration the difficulty there is in determining the exact position of the sac when arising from the beginning or end of the transverse portion, it would seem fair to assume that in much the larger proportion of cases the disease occurs in the transverse section.

Selecting a group of 159 cases in which the cause of death was determined—in 63 the sac ruptured; in 27 the fatal termination was due to valvular disease; 20 deaths were ascribed to pressure on trachea with broncho-pneumonia and cardiac failure; a similar condition of lung arising from pressure on left bronchus accounted for 7; while 6 succumbed immediately (within a few hours) to asphyxia from pressure on the trachea. In 28 cases of fusiform aneurysm, 14 died from valvular disease, 8 from pressure on trachea and bronchus with consecutive pulmonary disease, 3 ruptured, 2 died from kidney disease, and 1 from pressure on the superior vena cava and heart failure. When considering the statistics from the point of view of rupture, it will be seen that the trachea and pericardium are the most vulnerable structures, whilst rupture into the left pleura, left bronchus, and superior vena cava and oesophagus are of comparatively frequent occurrence.

Just a word about the pathological conditions that lead up to and accompany the development of the sac. Experience has taught us that these changes are rarely simple and uncomplicated; it is, for example, quite uncommon to meet with a sac springing from an otherwise healthy aorta; on the contrary, the aorta is, as a rule, extensively affected by, let us suppose, the ruthless ravages of syphilis, which cannot be neglected as a symptom-producing factor. Again, there may be more sacs than one, or one portion of the aorta may be dilated (fusiform), whilst another is the seat of a sacculated aneurysm, or the case may be complicated by valvular disease. All these points have their significance, and add to the difficulties of the diagnostic problem. Thus the earlier symptoms may be those of specific arteritis, and, indeed, not infrequently this condition dominates the clinical picture throughout.

AGE.

The usual age at which thoracic aneurysm develops seems to be from 35 to 50. Occasionally it has been met with in advanced life, but these cases are very rarely sacculated. Taking a series of 300 for comparison, the oldest case of sacculated aneurysm was 67 and the youngest 21. In the period of fifteen years named there were 180 cases, of which 128 were under 45, whilst 72 occurred between 40 and 45. A very few cases of this disease have been recorded in children, due apparently either to ulcerative endocarditis or some developmental defect. It is interesting to note that fusiform dilatation is also a disease of the middle period of life, though it is apt to develop later than sacculated aneurysm. For example, nearly two-thirds of the cases were between the ages of 45 and 55; or to institute a comparison, the period of greatest frequency in the case of fusiform aneurysm is the quinquennial of 50 to 55, as against that of 40 to 45 in sacculated. It must not, however, be supposed that fusiform aneurysm does not occur in younger patients, as a fair proportion of cases were between 35 and 40, but none were under 30. As is well known, aneurysm is rare in women; authorities, as might be expected, differ as to the relative frequency, but my own observations tend to show that it occurs about eight times as frequently in the male as in the female sex and that fusiform aneurysm is specially rare in the latter.

SIGNS AND SYMPTOMS.

The chief physical signs and symptoms of thoracic aneurysm and their order of relative frequency may be said to be as follows: Pain; cough, dyspnoea; pulsating tumour; alteration in second aortic sound; inequality of pupils; inequality of pulses; dysphagia; hoarseness, with paralysis of recurrent laryngeal; tracheal tug; tracheal whiff; murmurs.

A striking characteristic of aneurysmal pain is the fact that it is nearly always complained of at night. The patient may go to bed comfortable and free from symptoms, to awake with his customary pain in the chest, shoulder, or arm, as the case may be, for the relief of which he

usually alters his position, sitting up, lying on his other side, or possibly walking about the room. Or the pain may come on after lying for some time awake in one position. So frequently, indeed, is the pain nocturnal, that the statement by the patient that he is worse at night should always suggest the possibility of an aneurysm. In many cases there are two distinct types of pain—one anginal, worse through the day, aggravated by exertion, and relieved by resting; the other, the true aneurysmal pain, most pronounced at night, and relieved by change of posture. The former, anginal, is often referred to both arms; the latter very rarely.

It is important, in considering the symptom of pain in aneurysm, to recollect the nervous supply to the arch and its connexion with the spinal nerves forming the brachial plexus, etc. The arch, as we have seen, is supplied by sympathetic fibres, which come from the cervical ganglia, and which in turn communicate with the spinal nerves.

Fig. 1.—Relation between site of sac and position of pain (anterior view). A, No pain. B, Precordial. C, In front, third and fourth ribs, later between shoulders, occasionally down right arm, usually to right of sternum. D, Towards centre of sternum, second and third ribs; passes to shoulders, either right or left. E, Middle of chest, in front, either side sternum, and either arm. F, Occiput and back of neck and shoulders, right or left, more often left; also right or left arm, chiefly left. G, Back of head. H, Upper part sternum, second and third ribs, most frequently passes to left shoulder and down left arm. I, Left shoulder and chest, second costal cartilage. Not down arm.

Fig. 2.—Relation between site of sac and position of pain (posterior view). A, Middle of chest, right arm, and right shoulder. B, Right shoulder, later right arm. C, Begins in front of chest, to pass later to shoulders and arms; often throat. D, Shoulders, chiefly left, or in front of chest to left of sternum, soon to pass to shoulder. E, Often no pain. F, Left of sternum, fourth and fifth ribs, left shoulder, and back.

To explain the distribution of the pain it may be assumed that irritation passing from the arch along sympathetic fibres is referred to the sensory distribution of the corresponding spinal nerves, the intercosto-humeral, for example, or the small occipital, or great auricular, or supraclavicular. The common belief, therefore, that pain in aortic aneurysm is the result of direct pressure upon spinal nerves is no longer tenable, and we are forced to conclude that the sympathetic nerves conduct sensations affecting the cutaneous area in nervous correspondence with the affected part of the aorta.

A careful study of the area in which pain is first felt in a large number of cases of aortic aneurysm, verified by *post-mortem* examination, has led me to the conclusion that the position of the sac may frequently be diagnosed from the distribution of the pain.

Pain would seem to be a prominent feature of aneurysm in about 90 per cent. of the cases, but it must not be forgotten that there are one or two aneurysmal sites in which pain is a rare feature—namely, the sinus of Valsalva and the posterior part of the descending transverse arch (see Figs. 1 and 2).

An aneurysmal sac springing from the lower part of the front of the ascending arch produces pain referred to the precardium, generally about the right parasternal line, on a level with the third or fourth costal cartilage. Later it is referred to the right shoulder, and may, as time advances, descend the arm, though this is not constantly the case. When the sac is located on the right side of the ascending arch, the pain is usually felt in the upper part of the right side of the chest, second or third costal cartilages, with a tendency to pass early towards the right shoulder blade and down the right arm. The higher the position on the arch, the higher, as a rule, is the pain located by the patient; but soon, even when the sac springs from the front of the arch, as the upper limit of the pericardial attachment is approached, the pain tends to be referred towards the left shoulder instead of the right. A sac originating from the left side of the ascending arch commonly produces pain referred to the base of the heart and down the left arm, though in some cases it passes towards the right, affecting the right shoulder and right upper extremity.

It is interesting to note that the more the sac approaches the posterior part of the inside of the ascending arch the greater is the tendency for the pain to pass towards the right. Sacs that take their origin from the neighbourhood of the root of the innominate artery are very often associated with pain in the back of the neck and occiput (small occipital), and the same may be said of the upper part of the arch close to the left side of the innominate.* Aneurysms springing from the front of the ascending transverse on a level with the innominate root, but below it, usually cause pain on the front of the chest on a level with the second or third ribs towards the right or left side of sternum, or it may be in the middle (sternal branches from the descending cervical nerves), but the further to the left we go, even before the transverse proper is reached, we note a tendency for the pain to pass more to the left than to the right, and often to affect the left arm (left great cardiac nerve to superficial cardiac plexus); but it is a striking fact that sacs originating beyond the left subclavian artery do not produce pain in the arms at all. Here the symptom is generally referred to the left shoulder and left side of chest about the second costal cartilage. We may, therefore, conclude that aneurysms having their origin about the spindle—a frequent site—produce pain first in the left shoulder and later on the left side of the sternum, though this order may be reversed. Aneurysms arising from the posterior part of the ascending arch cause pain in the right shoulder (acromion branches). When from back of transverse, the shoulders and throat (transverse cervical nerve) are often affected, and it is a strange fact that posterior aneurysms tend to affect the right shoulder more frequently than the left, whilst the reverse is the case with sacs springing from the corresponding positions in the front of the arch. Several cases were met with in which even large sacs arising from the back of the descending transverse produced little or no pain, and this at times, curiously enough, notwithstanding considerable erosion of the vertebrae. When the sac takes origin from the back of the descending arch below the spindle, pain is generally referred to the left side of chest, about the fourth and fifth ribs outside the costal margin, and to the left shoulder and back.

Cough is often present for some time before any other symptoms manifest themselves. It is usually loud, ineffectual, and paroxysmal, and, in the absence of other signs of aneurysm, is often ascribed to bronchitis. Later on, it assumes a ringing, metallic character, and still later, the husky "leopard growl" which is so characteristic of pressure on the trachea.

Cough is not a necessary symptom of aneurysm, as in some cases, where the sac springs from the front of the ascending arch, there is little or no cough, while it is rarely present in cases arising from the arch below the descending transverse portion. In cases of aneurysm of the back of the ascending arch cough may be one of the earliest symptoms, and, when the right bronchus is compressed, is usually accompanied by shortness of breath. When the sac arises from the front of the transverse arch

the cough comes on later, as also does the dyspnoea; while if it spring from back and press on the trachea, it will cause a paroxysmal cough of a peculiarly loud explosive character early in the disease. An aneurysm from the ascending transverse arch, particularly from the posterior-inferior side, by interfering with the left bronchus will also produce early and troublesome cough. Cough is present in about 60 per cent. of the cases of aneurysm, as is also dyspnoea, which is closely associated with it.

The cough in the earlier stages is commonly ineffectual and attended by but scanty expectoration. Patients are wont to remark that it begins quite suddenly, lasts a few minutes, and is without expectoration at first, with an interval of a day or two between paroxysms. By degrees catarrh increases and clear or frothy mucus may be brought up; later, when the trachea or bronchi are seriously obstructed, muco-pus, sometimes in large quantities, is expectorated, when bronchiectasis suggests itself. It is important to note that in many cases, in which the tubes are dilated as the result of pressure, the expectoration remains free from fetor. As the obstruction increases the expectoration diminishes, and may indeed only reveal itself by the peculiar liquid rattling sound, the result of the patient's incessant effort to relieve himself.

Pulsating tumour, though a very frequent physical sign, is not always easy to distinguish, and must be sought for most carefully. At times it can only be detected when firm pressure is made over the chest at the

Fig. 3.—+, equal 53; O, right dilated, 13; Δ, left dilated, 5; •, right contracted, 7; ••, left contracted, 9.

end of a forced expiration, nor is it always an easy matter to distinguish between the cardiac impulse and an aneurysm.

The stethoscope is not a great help in the diagnosis of aneurysm, except in so far as it enables us to discover the peculiar alteration in the second aortic sound, which, when present, is highly suggestive. This physical sign is variously described as booming, accentuated, and drum-like. It is loud and voluminous, and is often best heard away from the aortic valves, practically over the sac at the point where it approaches nearest the chest wall, especially in cases in which the contents are fluid. Rarely a bruit independent of valve lesion is audible in the sac.

The pupils are frequently altered in thoracic aneurysm. In 87 cases in which the point was noted they were affected in 34 and equal in 53; in 13 the right was dilated, in 9 the left contracted, in 7 the right contracted, and in 5 the left was dilated. A careful examination of these cases with a view to establishing a connexion between pupil changes and site of sac made it clear that there was none, as sacs arising from every part of the arch were associated with equal pupils. Inequality was most frequent in cases of sac arising from the transverse portion, and chiefly towards the right side, where the right pupil was more commonly affected. As a rule, there was no alteration in cases confined to the ascending part, and rarely also in cases of descending aneurysm. On the left side of the arch the left pupil was the one more frequently affected.

Inequality of Pulses.—In some cases considerable skill is required to detect this sign, and when in doubt it is well to direct the patient to inspire deeply, and then slowly to expire to the fullest extent, whilst the observation is being made, for, as a rule, the movements of the

*To account for the pain in neck and occiput it is important to recollect that the heart is developed in the neighbourhood of the first four cervical segments and only descends into the chest in the course of development, the aorta necessarily making the same change.

chest in respiration affect considerably the size of the smaller radial pulse. Indeed, a deep inspiration will often abolish the inequality, and a forced expiration will exaggerate it—a phenomenon that is to be explained by the fact that in the majority of cases the inequality is the result of compression of the artery by the sac rather than internal narrowing of the lumen of the vessel, which pressure is relieved by the expansion of the chest. Not only may the pulse be reduced in size, but it is often delayed.

The dysphagia resulting from pressure of a sac from the descending transverse portion of the arch upon the oesophagus seldom amounts to serious obstruction, and may affect both fluids and solids, but more frequently the latter. The symptom varies much from week to week, and not infrequently passes off altogether. The patient, as a rule, points to the lower end of the sternum as the fancied site of obstruction.

Paralysis of the vocal cords is not always attended by hoarseness, therefore a searching laryngoscopic examination should be made in every case. The abductors are first affected, and later the adductors, which only become paralysed after considerable pressure on the recurrent; and abductor paralysis does not always produce change in the voice.

Tracheal tug is detected by gently grasping and attempting to elevate the cricoid cartilage, when a jerk can be felt synchronous with the cardiac systole.

Tracheal whiff may be heard either in the trachea or in the mouth; it is usually systolic, but may be double, and is loudest when the patient is expiring slowly after a deep inspiration with the mouth wide open.

PRIMARY SARCOMA OF THE LUNG.

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PRIMARY sarcoma of the lung is admittedly a rare disease, and the following example is therefore, I think, worthy of record.

HISTORY OF THE CASE.

The patient, a shepherd, aged 43 years, was admitted to hospital on May 2nd, 1907. He was in his usual good health until early in March, 1907, when he says he suffered from a bad "cold." About the first week of April he first noticed that his face commenced to swell, and about the same time he began to suffer from shortness of breath. Towards the end of April both legs became swollen. The dyspnoea gradually increased, and for a fortnight before he was admitted to hospital he had been unable to lie down in bed at night owing to the great difficulty in breathing which occurred when he assumed a reclining position. The only other complaints made by the patient were those of pain in the right side of the chest, and of "wind."

Previous History.

His previous health had always been excellent; he had had no venereal disease, and had not drunk immoderately. He is a married man with eight children, all of whom are in good health, as is also his wife.

Condition on Admission.

He is a powerfully-built man. There is considerable distress in breathing, but there is no stridor, and the voice is natural. The temperature on admission was 99.4° F., the respirations were 22, and the pulse-rate 123 to the minute. Both radial pulses were equal; there was no irregularity nor inequality of the beats, and there was no appreciable arterial thickening. The appetite was bad, the tongue slightly coated, and flatulence was troublesome; the bowels acted daily. There was very little cough, and only a small amount of mucous expectoration.

The face and neck were swollen, the eyelids puffy, and there were numerous enlarged venules on the nose and cheeks. The skin of the face, neck, and lobes of the ears was markedly cyanotic in hue. The pupils were equal, and reacted normally. There was no difficulty in swallowing. The lips and tongue were distinctly cyanosed. The lower part of the neck appeared markedly full, the external jugular veins were considerably distended, and there were a few enlarged subcutaneous veins to be seen coursing over the upper part of the chest, back and front. Tracheal tugging was not obtained. The superficial veins of both arms were very prominent, the hands congested, and the nails dusky. Slight pitting could be obtained over the front and back of chest and over the lumbar regions. Both legs, from the feet upwards, were markedly oedematous, as were also the penis and scrotum.

There was no abnormal bulging or pulsation to be seen or felt anywhere over the chest walls. Chest expansion was poor. Vocal fremitus was increased over the upper part of the right

lung in front. Above the right clavicle and below it as far as the fourth rib in front, and from the apex of the right lung behind to a point just below the spine of the scapula, the percussion note was almost quite dull, as it was also in the upper part of the right axilla. Over these dull areas the breath sounds, which were very feeble, possessed a distant bronchial character, and bronchophony and pectoriloquy were to be heard over these parts. Elsewhere the pulmonary regions appeared healthy.

The heart's apex beat could not be located, but the first sound was to be heard best in the normal position. The cardiac dullness was not increased in extent, the heart sounds were clear and free from murmurs, whilst the second sound appeared distinctly accented over the dull area of the right lung.

A large tributary of the internal mammary vein was seen coursing from the region of the navel towards the xiphoid cartilage. The anterior abdominal wall was somewhat oedematous, the liver and spleen could not be felt, and there was no evidence of ascites. Urine was passed with difficulty, owing to oedema of the prepuce; it was of normal appearance, and contained neither albumen nor sugar.

In the right axilla were a few enlarged and tender glands, the largest being about the size of a filbert. No other enlarged glands were to be felt.

Owing to the distressed state of the patient an x-ray examination of the chest was not attempted.

Diagnosis.

A diagnosis of probably malignant growth involving the right lung was made.

Progress of the Case.

On the first night after admission the patient was allowed to sit by the bedside, as the reclining posture was unbearable to him. At the side of the bed, with his elbows resting on the edge and with his body well forward, he used to sit night and day, and in this position get whatever snatches of sleep he could. After a few days even this position became intolerable, and he then took to lying on the bed, resting on elbows and knees. During the last few days of his life he assumed the genu-pectoral position on the bed, and held his head over the edge considerably below the level of the rest of his body.

As the disease progressed, the venous distension of the upper parts of the body gradually increased, and the oedema of these parts became extreme. The face and neck became enormously swollen, the eyelids became completely closed from the oedema and the conjunctivae extremely injected and chemotic. The legs, abdomen, and scrotum became very oedematous; urine was passed in very small quantities, and before death occurred the whole surface of the body became markedly dropsical.

Frequent attacks of extreme difficulty in breathing occurred from time to time; these were somewhat relieved by inhalations of oxygen, but most relief, although only very fleeting, was obtained from venesection, which was several times carried out.

During the last few days of the patient's life transient attacks of delirium occurred from time to time, unconsciousness gradually developed, and death took place on May 12th.

The temperature chart of the patient showed a slight irregular fever.

Post mortem Examination.

The upper parts of the body were cyanotic, and there was generalized surface oedema. The veins of the neck were enormously dilated and contained dark fluid blood. There were no enlarged glands to be found in the neck.

The right lung was completely adherent to the chest wall, and, with the exception of a small piece at its base, was occupied by a firm whitish growth, mottled with grey in parts, and in which were seen a few small haemorrhagic foci. From the lung the growth had extended forwards into the anterior mediastinum and had partly eroded the overlying ribs. The structures at the root of the right lung were compressed and invaded by the growth, which had also extended to the posterior mediastinum and had eroded parts of the bodies of the adjacent vertebrae on both sides. The glands at the bifurcation of the trachea were of a deep black colour and were invaded by extensions of the growth from the lung.

The left pleural cavity contained some clear serous fluid and the lung was oedematous; there were no secondary growths in these parts.

The pericardium contained several ounces of dark fluid blood, and its parietal layer was speckled with small seed-like secondary growths. The heart was collapsed, and on the surfaces of both auricles and ventricles were to be seen numerous nodules of secondary growth, varying in size from a pea to a cherry, a few, however, being flat and covering a larger area. At the base of the heart the large arterial and venous trunks were completely obscured by disseminated secondary nodules, which had rendered these parts very stiff and rigid.

The peritoneal cavity contained a considerable amount of flaky serous fluid. The liver, spleen, and kidneys were greatly engorged with blood and the stomach and intestines greatly distended with gas; there were, however, no secondary growths to be seen anywhere in the abdomen.