LUMLEIAN LECTURES

ON THE

NATURAL HISTORY AND DIAGNOSIS OF
INTRATHORACIC CANCER.*Delivered before the Royal College of Physicians, 1870.*By JAMES RISDON BENNETT, M.D.,
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II.

PASSING, now, from the consideration of examples of diffused cancerous deposits in the lungs, having more or less analogy with diffused tuberculation, I select some examples illustrative of limited implication of the lungs and ultimate changes of structure, in which, during life, the physical signs correspond so closely with those which are common to chronic limited tubercular disease, passing into the stage of complete pulmonary disintegration, as almost to defy the most acute powers of diagnosis. Such cases are not, however, very common; *i.e.*, cases uncomplicated with unquestionable evidence of tumour or some other indication, rendering it plain that we have to do with something different from common tubercular disorganisation.

George Brown, aged 57, was admitted the 5th September, 1863, and died on the 19th. A tall, spare man, who, on admission, had a phthisical aspect, was anemic, the subject of great debility, slight cough, which was once or twice attended by slight hæmorrhage and the physical signs of tubercular disease of the left apex; *viz.*, some dulness and deficient respiration, with crepitation and increased vocal resonance. There was, however, no febrile disturbance; and the pulse, at first, was not quickened, but extremely feeble, and the man's chief complaint was of extreme debility; there was no dysphagia, nor indeed any local symptoms except such as were connected with the apex of the left lung. The extent of dulness was not great, and was most marked beneath the sternal end of the left clavicle, and immediately above the clavicle. The augmentation of vocal resonance was considerable; but, taking into consideration its seat, in immediate proximity to the trachea, was not at all remarkable. Fine crepitation, mixed with loose mucous rales, was very distinct, and the respiratory murmur, which was deficient, had a harsh bronchial character. The constitutional condition however was, to say the least, unusual, viewing the case as one of phthisis, and convinced me that there was something more than I could discover to account for it. Especially was I struck with the man's extreme debility, his apathetic manner, his remarkably small, feeble, and infrequent pulse. I could not elicit any history of previous ailment, nor admission of any local pain or functional derangement, though he had considerable anorexia. I was disposed to infer that he was under the influence of some great moral depression. There was no dyspnoea, and the cough was insignificant. A few days after his admission, he had profuse hæmoptysis; and immediately succeeding thereto, insufferably fetid breath and expectoration, and manifest signs of a gangrenous cavity. He became exceedingly exhausted, and after again vomiting a large quantity of blood, sunk and died. The evidence of gangrene of the lung appeared to explain, in some measure, the extreme prostration, which was the most marked general symptom; and I was certainly not prepared for what was revealed by the *post mortem* examination. This took place on the second day following his death.

POST MORTEM EXAMINATION, September 21st.—Body pale and emaciated. In the upper part of the posterior mediastinum, and extending into the neck, was an irregular mass of somewhat soft cancerous growth, situated chiefly on the left side, firmly adherent to the bodies of the vertebræ behind, and communicating with the œsophagus by an extensive ulcerated surface which looked black and sloughy. The left side of the cancerous mass pressed against the left pleura; and here, at the apex of the left lung, was a gangrenous cavity formed between the lung and the pleura by destruction of the lung-substance, and limited by surrounding pleuritic adhesions. The cavity was nearly as broad as the palm of the hand; contained pulpy, fetid, semifluid matter, apparently *débris* of lung-tissue, and exhibiting, on microscopical examination, a quantity of granular and amorphous matter, but few or no cells. The cancerous mass, however, abounded in cells of various irregular, roundish, or fusiform shape, with nuclei. The remainder of the upper lobe of the left lung was in a state of grey hepatisation, soft, and easily breaking down. Portions of the lower lobe were also consolidated.

The right lung was healthy, except a slight degree of emphysema at the anterior part. The trachea was not implicated by the cancer. The heart was small, valves and cavities normal, but the muscular substance was undergoing fatty degeneration. The aorta presented a few patches of atheroma. The lower part of the œsophagus and the stomach were distended by several pounds of blood, chiefly coagulated. The part of the œsophagus below the cancerous mass, as well as the stomach and intestines, were free from cancer. The remaining organs were essentially healthy.

In this case it is evident that the disease commenced in a mediastinal growth, and that the lung became subsequently involved not by extension of cancerous growth, but by surrounding inflammation and destruction of tissue consequent thereon. The case, therefore, affords an illustration of the remarkable tendency there is in mediastinal or other tumours of a cancerous nature outside the lung to set up inflammation in the adjacent lung-tissues and pleura, whilst, as a rule, there is little if any similar tendency in cancerous deposits in the lungs themselves to involve the surrounding parts in any such inflammatory changes. Nor, in the present instance, was there any evidence to justify the opinion that pressure, either on the vessels or nerves, had any influence in inducing the destructive changes in the adjacent lung; nor have such results in other instances appeared to me to hold any clear relation to the amount of pressure on either nerves or vessels.

Death by hæmorrhage, as a consequence of cancer of the lung, is very rare. The amount lost in the case just detailed was considerable, and was, even during life, evidently due to breaking down of the lung. But in a case recorded by Dr. Church, the hæmorrhage partook so much of the character seen in connection with aneurism, that it was supposed to be due to that cause.

A man aged 39 was admitted into St. Bartholomew's Hospital with symptoms of intrathoracic tumour, the nature of which could not be decided, but was supposed to be aneurismal, the leading symptoms being dyspnoea and convulsive cough, and recurring attacks of hæmoptysis; death eventually ensuing after the bringing up of about four pints of blood. An irregularly shaped mass occupied the anterior mediastinum and encroached on the right lung. The right bronchus was much compressed and contracted, and the right pulmonary artery surrounded, but its coats not involved. The mucous membrane at the point of contact was much congested, and the adjacent lung-tissue broken down. There was a small clot of blood in the midst of the broken down tissue. A considerable quantity of blood was found in the bronchi; but the actual vessel, or vessels, through which the hæmorrhage had taken place, was not discovered. No large branch of the pulmonary artery had given way.

In one of Dr. Pollock's cases at the Brompton Hospital, the hæmorrhage partook more of the character seen in phthisis. The physical signs closely resembled those of phthisis, of which disease both parents had died. The first attack of hæmoptysis took place sixteen months before death, when the blood was black and clotted; but on the subsequent frequent recurrence, it was fluid and florid. The general symptoms also corresponded with those of phthisis; *viz.*, dyspnoea, cough, with white thick expectoration, night-sweats, emaciation, and anorexia. The case appears to have been one affecting the bronchial glands in the first place, thence invading the left lung, and, to a slight extent, the right. Both lungs were also consolidated beyond the cancerous mass to a considerable extent by cancerous pneumonia. The general symptoms were probably due, in a measure, to this complication.

Slight hæmoptysis in the early stages of pulmonary cancer has been often noticed; indeed, in many cases, has been the earliest symptom; and there is some reason to think that, as in phthisis, so also in cancer, copious hæmoptysis may take place in a stage prior to the actual existence of cancerous deposits. Generally, the first attack of hæmorrhage, from the giving way of an aneurism, dates from no long time prior to the fatal attack, although in some rare instances—as in Dr. Gairdner's case—the interval has extended to years. I find several examples of hæmoptysis from cancer preceding death more than a year.

In two other instances in which I have met with gangrene of the lung associated with cancer, it was quite evident that neither pressure on the nerves nor interrupted circulation had any thing to do with the gangrene. In one of these, there were in the right apex two small intercommunicating cavities, together about the size of a filbert, filled with stinking puriform fluid, and surrounded by solid slightly indurated tissue of a greenish gangrenous hue, which yielded a yellow creamy juice on pressure, showing, under the microscope, the characters of cancer. The case was that of a man who died of cancer of the pylorus, and no other disease existed in the lungs, except a little emphysema and a few puckers connected with old induration of the surrounding lung-tissue. In the other case (a man aged 27, *Pathological Transactions*, vol. iii, p. 35), there was extensive gangrene of the lower lobe of the right lung, the upper

lobes being healthy, with the exception of a little emphysema. The opposite lung was entirely solidified, the upper portion being a mass of cancer. The left bronchus was obliterated, and the large vessels on this side pressed on; but those of the right (the gangrenous) side and the corresponding tubes were quite free. There is, however, no doubt that stagnation of blood in the ultimate venous radicles is very apt to occur in connection with the cancerous cachexia; and it is believed by many that the secondary cancerous nodules of the lungs generally occur in this way. It is easy, therefore, to understand how, in an enfeebled cachectic state, complete loss of vitality may thus occur in the surrounding tissue, and so gangrene. This tendency to obliteration of the capillaries and the formation of fibrinous deposits, is well illustrated by the following case.

A man, aged 47, came under my care suffering from malignant disease of the stomach and liver, and sank rapidly, exhausted by cancerous cachexia. The lungs were found generally congested and oedematous, the upper lobes being somewhat emphysematous. In the margin of the lower lobe of the left lung there was a small whitish mass having very much the aspect of cancer. A few old adhesions existed in the right pleura, in the cavity of which were about three-quarters of a pint of serum. The right lung was covered by a layer of recent lymph, but the lung itself was crepitant throughout, and not so congested or oedematous as the left; the anterior margin was emphysematous. In the anterior lower portion of the upper lobe there was a solid mass nearly as large as a hen's egg, varying in colour from a brick-red to grey, abruptly margined and presenting a rim of grey substance; it was non-crepitant, and studded with black deposit. Like the surrounding lung-substance, it was of some degree of toughness, but broke down readily. The bronchial tubes were healthy, the smaller ones containing much mucus. The heart and pericardium were healthy; but on the aortic valve there was a growth of the size of a small hazelnut, soft and elastic to the touch; but on section, toughish, which yielded no juice on pressure. There were also a few small whitish masses in the substance of the musculi papillares. Some softening clots were attached to the chordæ tendineæ. About the tricuspid valve there were similar growths to these on the aortic valve. The liver was thickly studded with cancerous growths, yielding creamy juice on pressure. The stomach presented an ulcer of some extent in the cardiac end, and was much implicated by cancerous disease. The spleen presented patches similar to those in the lung. Careful examination by the microscope rendered it doubtful whether any of these patches in the spleen and the large mass in the lungs were anything more than fibrinous patches; but the growths in the stomach and liver were distinctly cancerous. The masses connected with the valves of the heart were softening clots.

The more usual way in which cavities in the lungs result from cancerous disease, is by the degeneration and breaking down of encephalomatous masses; and, as might be anticipated, the symptoms and physical signs in such cases closely resemble those of phthisis. An example of this has been recorded by Dr. Peacock (*Transactions of the Pathological Society*) which is of remarkable interest, not only from the close resemblance it presented to phthisis, and from some special features, but also from its duration. For if we assume the disease to have commenced with the first attack of hæmoptysis, it lasted fully eighteen months; and this is a much longer period than most of the recorded cases of pulmonary cancer. This patient was a man 38 years of age, whose illness began with hæmoptysis. Subsequently he expectorated casts of fibrinous-looking material from the bronchi. On examining the chest, there was considerable want of expansion, and deficiency of resonance on percussion, in each subclavicular region, especially on the right side, where irregular crepitation and bronchial respiration were audible. He subsequently complained of dyspnoea, cough and expectoration, and thoracic pains, especially of the left side. He lay with most ease on the right side. His appetite was defective, and he had epigastric pain and diarrhoea. The case was assumed to be one of chronic phthisis. Subsequently the face became puffy, and general anasarca followed, the urine being devoid of albumen. A month later, he was seized with severe dyspnoea, pain and dulness in the lower part of the left side, where mucous and subcrepitant rhonchus were heard. The dropsy subsided, but the face continued swollen, and he gradually sank and died.

Both lungs were found to be firmly adherent to the parietes; the left alone was removed, which was voluminous. The upper part contained numerous anfractuous cavities; and in the lower portion there was much solidification, with collections of pus. In the anterior portion there were several masses of whitish yellow-coloured deposit, resembling medullary sarcoma—some as large as a hen's egg. The right lung was less extensively diseased, and other organs were healthy. The diseased tissue from the lung was examined microscopically by Dr. Bristowe, and found to be degenerating encephaloid matter, and corresponded to the results of the examination of the expectorated masses.

It is not, however, only when there is evidence of breaking down of the lung, that the physical signs, as well as the general symptoms, closely resemble those of phthisis. There is not infrequently limited flattening and altered form of the chest, in connexion both with the early stages of mediastinal tumours and of deposits in the substance of the lungs, without any breaking down of the lung, which is very apt to mislead. This is well illustrated by a case of Sir Thomas Watson's, recorded by Dr. Ogle in the *Transactions of the Pathological Society* for 1865. The patient was a lady, twenty or twenty-two years of age, who had been four years married, and had one child. She had had cough for some time, and latterly this had been worse; and she had been troubled with pains, apparently rheumatic or neuralgic, across the chest, impeding at times her breathing. There was no expectoration; but much wasting and night-sweats existed. The chest, which had been full and expanded, was unsymmetrical, the left side being visibly flattened. On that side, subclavicular dulness on percussion existed; also coarse respiration, with some moist sounds and vocal resonance. On the right side behind, in the upper part of the lung, there was tubercular blowing on expiration. The cough was most troublesome when the patient lay on the left side. The case was regarded as one of tubercular phthisis; and the patient went to Cannes, where she died soon after her arrival. On *post mortem* examination, the pleuræ and pericardium were filled with serum, and the anterior mediastinum occupied by a dense white mass involving all the great vessels. The substance of the lungs and the walls of the heart also, in many parts throughout their entire thickness, especially in the case of the auricles, were infiltrated by nodules and diffused deposits of medullary cancer. The lymphatic glands at the base of the heart and at the root of the lungs were especially the seat of morbid deposit, which also predominated in the course of the vessels, although neither the calibre of the vessels nor of the air-passages was interfered with.

In many other cases on record, a limited falling in of the thoracic parietes below the clavicle, associated with equally limited signs of solidification, has led to the belief that phthisis was the cause.

My next case is an example of cancer affecting both the lungs themselves and the mediastinum, in which the physical signs were at first limited to the apices, and resembled those of phthisis, but subsequently became associated with signs of pressure and spasmodic symptoms, indicative of serious implication of the nerve-trunks. The account which the patient gave of her previous history, and of having lost two members of her family from consumption, tended to confirm the diagnosis that was first made, of limited tubercular disease of the lungs.

Eliz. Spall, aged 49, a married woman, who had had a family, of spare habit of body, looking much older than the age she gave herself, was admitted under my care at St. Thomas's Hospital on July 16th, 1869. She had a depressed and suffering expression of countenance, was of dark complexion, but not very unhealthy aspect. She stated that for five or six months she had suffered from cough and shortness of breath, attended with loss of appetite and of flesh, and considerable debility. These symptoms had become much more marked during the last six weeks. Her parents, she said, had been healthy, and lived to a good age; but she had lost a brother and sister of consumption.

The chest was somewhat flattened beneath both clavicles, and the percussion resonance on the right was somewhat greater than on the left. The respiration in the right apex was very harsh and bronchial in character, especially behind; and there was increased vocal resonance. Some rhonchus and coarse mucous crepitation were heard in both apices, and a little here and there throughout the chest; but the principal auscultatory phenomena were confined to the right apex. Her cough was very troublesome, occurring in paroxysms, and attended by expectoration, for the most part thin, but containing also masses of muco-purulent matter, and occasionally streaked with blood. She complained of pain and general uneasiness throughout the chest. There was considerable anorexia and general debility. The bowels were constipated; the circulation quiet and feeble.

Ten days after her admission, there was a considerable amount of dyspnoea, or sense of breathlessness, even when quiet; and the least exertion put her very much out of breath. Paroxysms of extreme dyspnoea and distress then became frequent, compelling her to retain the upright posture; and distinct laryngeal stridor attended the breathing. On August 2nd, metallic resonance on coughing, and loud tubular breathing, could be heard over the right apex behind. The expectoration at this time was more copious, but of the same character. It was at this time inferred that she had some intrathoracic growth, probably malignant. She had lost much flesh since admission, and was extremely exhausted, with a small feeble pulse. Stimulants and opiates gave a certain amount of relief; but she sank, apparently from exhaustion occasioned by the extreme dyspnoea and incessant paroxysms of cough, on August 22nd.

POST MORTEM EXAMINATION, August 23rd.—Brain and its membranes healthy. Larynx healthy. Trachea and bronchi much congested and greatly compressed by a morbid growth around them; they contained a good deal of mucopurulent matter. The lungs were swollen and large, and in the substance of each were several masses of encephaloid cancer. The upper lobe of the right lung was, however, the principal seat of disease, a considerable portion being in a softened and completely disintegrated condition. Much of the surrounding lung-tissue was consolidated, and the lower lobe of each lung was congested. The upper lobes of each lung were adherent to the costal pleura by firm and apparently old adhesions. The greater part of the mediastinal space was occupied by a mass of rather hard cancerous infiltration, involving the bronchial glands, and compressing the trachea, bronchi, and large vessels and nerves. The pericardium contained from six to eight ounces of turbid serum. The parietal layer was thickened here and there, and the seat of cancerous infiltration, especially near the root of the lungs. The heart weighed twelve and a half ounces, and its muscular structure was flabby. The walls of the aorta contained several small cancerous deposits. The microscopical examination of the mediastinal growth revealed well marked cancerous characters, the greater part of the cell-forms having more or less of a fusiform shape.

In this instance, the disintegration of lung-structure appeared to have resulted from the softening and breaking up of the infiltrated cancerous matter, the original seat of which was probably in the bronchial glands, and not, as in the case of Browne (previously detailed), from gangrene of the lung, notwithstanding that in this instance the symptoms during life, as well as the *post mortem* signs, showed great and extensive pressure on both nerves and vessels. Nor were there in the present case any of those evidences of paralysis of the bronchial tubes which often lead to remarkable ulterior changes, and of which I hope to be able to afford an illustration subsequently.

The dyspnoea and general distress were in this instance considerable, but only during the last two or three weeks of life. These symptoms depended, probably, on the amount of pressure on both nerves and vessels; for in other cases, where even the whole of one lung has been either destroyed or rendered useless, as in a case to be subsequently detailed, I have found little or no dyspnoea or distress attending the respiration when the patient has been quiet. There may be even a considerable amount of obstruction of the trachea from surrounding pressure, without the proportionate dyspnoea that might be expected. If, however, there be any considerable degree of pressure, or irritation of the recurrent laryngeal nerves, then, I believe, we have invariably a great amount of both dyspnoea and distress. So also, if the large veins are so implicated by the disease as to be exposed to varying degrees of pressure, we find varying degrees of dyspnoea corresponding to the varying amount of general pulmonary congestion thus induced. Accordingly, we find these symptoms most marked in cases where the bronchial glands are extensively implicated, and where the cancerous disease occupies the upper part of the mediastinum. The greatest amount of suffering I almost ever witnessed attended the next case I shall relate, in which great but varying degrees of lividity of countenance was associated with extreme pain and dyspnoea, protracted over a period of nearly three months. This case belongs, perhaps, more properly to the third division of my subject; but I introduce it here.

Primary Cancer of the Bronchial Glands, involving the Great Vessels, Right Bronchus, and Recurrent Nerves, but not the Pneumogastric.—S. Fielder, a married woman, aged 47, who had never borne children, stated that her health through life had been good (with the exception of having suffered from what she called bronchitis) up to March previous to her entrance into Victoria Park Hospital, August 28th, 1867. In the month of March, she had again so-called bronchitis, which was attended by sharp pain in the right side; since when she had had gradually increasing dyspnoea, loss of flesh, and cough. On her admission, she was in a state of wretched destitution, and apparently dying. She was of small stature and spare frame. Her dyspnoea was of the most extreme and urgent character; her face deeply livid, surface cold, and pulse scarcely perceptible. She rallied after a while, so as to be able to take nourishment and obtain a little rest. The least exertion or excitement immediately induced cough and severe augmentation of her dyspnoea; and the thoracic parietes also were so extremely sensitive, that any physical examination was quite impossible. Her position in bed was generally semi-erect and bent forward; and it was observed that the right side of the neck was swollen; and that on coughing, or when under a paroxysm of dyspnoea, there was an immediate and great tumefaction of the supraclavicular regions, especially of the right side. The expectoration was at times copious, and generally frothy. From time to time, partial and very hasty examinations of the chest were instituted. On October 14th—*i. e.*, a week after her admission—the following record was made. “Infracavicular and supramammary regions of the right

side more prominent than the corresponding regions on the left. Superficial veins much distended, especially on the left side. Respiration heaving and abdominal, and accompanied by laryngeal stridor. Percussion-note dull under right clavicle, preternaturally sonorous under the left; and a corresponding difference in the supraclavicular regions. Respiratory murmur wholly absent in upper portion of right lung, and nearly so in the left; but some noisy bronchial breathing in both apices. Respiratory sounds wholly absent below the right scapula; where, however, the percussion-note is good. Puerile respiration towards the base of the left lung; nowhere any moist sounds. Dulness in whole of right supramammary region absolute, which also is more prominent than the left. Motion of right side impaired. No distension of intercostals. Heart's impulse felt *in situ*, and its sounds transmitted through the whole of right side. Breathing attended with much effort and distress, and considerable lividity of face.” The diagnosis at this time was intrathoracic tumour, probably malignant.

A fortnight later, the following note was made. “Both supraclavicular regions still more distended and protruding, having a soft elastic feel, and traversed by nodulated and distended veins. A considerably enlarged gland nearly over the sternal end of right clavicle; and smaller glands can be felt here and there in the neck. The tracheal stridor so masks every other sound, that auscultation elicits no reliable information, although air appears to enter the left lung, and the left side is for the most part quite resonant on percussion; but the dulness is absolute over the whole of the right side. Heart apparently *in situ*; if anything, a little to the left. Dyspnoea very great, and great sensitiveness of the surface, especially on the right side; and the same remarkable increased swelling of the lower cervical region when coughing or in the least excited. Expectoration frothy, with a little glairy opaque mucus. (Diagnosis, malignant disease.)”

The patient remained in much the same state till the 20th of the month, the paroxysms of extreme dyspnoea and suffering becoming more frequent, and the face very livid. About this time, the face, neck, and upper extremities became oedematous, and the lividity extreme. The pulse was almost imperceptible, and the surface cold; and she died about noon on the 21st.

POST MORTEM EXAMINATION.—There was considerable lividity and oedema of the face and upper extremities still remaining; but the fulness of the lower part of the neck was much less apparent than during life, though the enlarged glands were more distinct and more numerous than they appeared in life. On removing the sternum, a firm growth was discovered rising up from the anterior mediastinum, partially adherent to the posterior surface of the sternum, and extending upwards as high as the attachment of the sterno-mastoid muscles, and laterally on the left side beyond the edge of the sternum, whilst on the right side it was firmly adherent to the ribs about their junction with the cartilages. The trachea occupied its normal position in the neck; but immediately behind the manubrium, where it became involved in the morbid growth, it was somewhat flattened and pushed towards the left. The thyroid gland occupied its normal position, and was not enlarged. The superficial veins of the neck were enlarged, and distended with blood. On either side, there was a mass of enlarged glands (the largest about the size of a pigeon's egg), involving on the right side the great vessels and recurrent laryngeal nerve. The pneumogastric nerves, however, were not involved, although in contact with the masses. The heart was in its normal position; the left pleura perfectly free from adhesions; the right universally adherent from apex to base. The contents of the chest having been removed *en masse*, the growth was found to arise from the bronchial glands, completely investing the trachea and bronchi, except at their posterior aspect, the trachea being flattened and somewhat twisted on itself. The right bronchus was much compressed and flattened, but pervious. The left bronchus, though somewhat flattened, was not nearly so much compressed as the right, and allowed free entrance of air. The morbid growth, with the trachea, bronchi, and larynx, weighed 1 lb. 3 oz. The right lung was greatly compressed, collapsed, and airless, sinking in water, and with the thickened pleura, weighed more than the left, which was somewhat emphysematous, but otherwise healthy. The visceral pleura of the right lung presented a number of small nodules, of about the size of a pea, of similar material to that of the morbid growth. The heart was firmly contracted, each ventricle containing a clot. There were no secondary deposits found in any of the other viscera.

It will be observed that, though the duration of the disease in this case extended over many months at least, and though the right lung was rendered entirely useless and the large vessels obstructed, yet, the pneumogastric nerves being unimplicated, as well as the pulmonary plexus, we had none of those disorganising changes in the lung which are so remarkable in other cases. On the other hand, the recurrent nerves being involved, we had the characteristic distressing paroxysmal dyspnoea

which formed so striking a feature in this poor woman's case. The very general pleuritic adhesion and thickening of the one side and the immunity of the other is difficult of explanation; for, though the morbid growth had extended principally towards the right, it crossed to the left of the sternum, and the large vessels of the left side were involved; so that we might naturally have looked for a corresponding implication of the left pleura in that inflammatory action which leads to adhesions. I am disposed to think that there had been some old pleuritic affection of the right side, independent of, or accidental to, the morbid growth. But, however this may be, the case shows how different may be the condition of the lung even in protracted cases, and how much the physical signs may thus be modified.

ON THE NATURE OF THE CONDITION CALLED EPILEPSY.

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THERE are, perhaps, few subjects upon which the consideration of the physician has been concentrated, which are apparently more obscure than the proximate cause of that mobile condition of the nervous system called epilepsy; while it is certain that within the whole range of medicine, no class of disease has been subjected to the tentative method of treatment with a more decidedly negative result. It has, however, occurred to me that the origin of this state is not really shrouded in such mystery as at first glance appears; and that by a careful study of the evidence which Nature has tendered, we may learn to read her aright in this as we have done in other pathologies.

The first real step in advancing our knowledge of the subject was made by Schroeder van der Kolk, whose researches were followed by those of Brown-Séquard. To these we must add the careful observation of the illustrious Trousseau; and since, a number of eminent and able practical observers, both on the Continent and in our own country, have added greatly to our store of learning on the subject. It is, however, not my intention in the present paper, to reproduce what has been done, except in so far as quotation may be necessary for the illustration of the ideas herein to be put forward. I may state in the onset that I have repeated many of Brown-Séquard's experiments, and that I have instituted independent ones. It is, however, unnecessary and wearisome to restate burdensome details, and I propose rather to generalise the induced conclusions.

The following are the ideas which it is my intention to attempt to establish.

1. Epilepsy is a contraction of the cerebral capillaries and small arterial vessels; the order of its stages in an epileptic attack being, irritation of brain, either direct or secondary to exhaustion; contraction of cerebral capillaries and small arterial vessels; cerebral anæmia, and consequent loss of consciousness.

2. The muscular contraction and spasm, together with all the varying phenomena associated with epilepsy, are altogether secondary, and not at all essential or constant, but they are all manifestations of imperfect nervous (cerebral) control, or a loss of balance between the nervous and other systems.

It is perhaps unnecessary to prove loss of consciousness as the first subjective phenomenon of epilepsy, since it is on all hands admitted; or, as stated by Trousseau, it may be considered the pathognomonic sign of epilepsy. To whichever variety of the two great specific forms—*le petit mal* and *le haut mal*—any individual seizure may belong, we can always, by strict inquiry, find some amount of unconsciousness in the first stage. The absolute fixedness of this rule—which may almost be called a law of epilepsy—has been doubted, I know, by few. I shall endeavour to meet their objections further on in this paper.

The condition of anæmia is, strange to say, the one which was long unobserved; and, in fact, only within the last few years has it been noticed at all. The congested state of the vessels of the face and neck attendant upon epilepsy is secondary; but so much more striking is it, that for long it was the only condition of vascularity observed. The pallor of epilepsy is sometimes of considerable duration; but this is more particularly the case in *le petit mal*, the almost endless varieties of which were not until lately recognised as epileptic, and, consequently, as they were considered as fainting attacks, the attendant pallor made no impression on observers: usually, however—especially in *le grand mal*—it is fleeting. The fact of pallor, however, is an indication, though not a certain evidence, of cerebral anæmia. It would appear highly probable that the face and neck sympathise with the internal condition of the skull as regards sanguiference; but further evidence is necessary, since, on simple principles of animal mechanics, if one set of vessels be

empty another set must be more or less full; and the question might reasonably be asked, why the surface-vessels of the head should not be the ones to take up the opposite condition to that of the cerebral. The question would, however, be specious, since it is the venous rather than the arterial vessels that receive the blood; but this is not altogether absolute. The best evidence that the surface-vessels correspond with those of the cerebral is, that consciousness is lost during the anæmic state, while, in conditions presumably congestive, e.g., the paroxysm of whooping-cough, consciousness never, in the true sense of the expression, disappears.

Animals that have died or been killed during a fit, have always exhibited brains perfectly anæmic, blanched, and bloodless. This is borne witness to by Schroeder van der Kolk, Trousseau, and Brown-Séquard, and has obtained in all my own experiments and observations.

3. Whenever cerebral anæmia is by any means brought about, loss of consciousness is the result; e.g., if pressure be made upon the brain or cerebral membranes of an animal, or if the brain be wounded, anæmia and loss of consciousness instantly result. In the case of an infant among the out-patients of Guy's Hospital, said to be epileptic, I made simple pressure with my finger upon an open fontanel, and produced the whole of the epileptic phenomena perfectly. An animal bled to death passes through all the stages of epilepsy before the final struggle. It is hardly necessary to multiply the evidence on this point. It is essential, however, to demonstrate the fact of the contraction of the capillaries and small arterial vessels as a result of irritation or exhaustion, as it is to this contraction that the anæmia and loss of consciousness are due.

Direct irritation, such as that already mentioned, viz., pressure on the membranes or a wound of the brain, are always followed by instantaneous contraction of the smaller cerebral vessels; but, at the same time, the capillaries of the medulla oblongata become distended. This point is one particularly worthy of notice, and was first observed by Schroeder van der Kolk. If an animal be trephined, and a knife plunged into his cerebrum, the whole of that organ will become instantly anæmic, and its small vessels will be found contracted, while those of the medulla—particularly the capillaries—will be found full and distended. It is well to try this experiment on an animal, the subject of epilepsy, as the constant recurrence of the seizures permanently dilates the capillaries of the medulla. It must not be assumed from this that the blood from the cerebral vessels passes to the medulla. It is more likely that, on account of the sudden check to the circulation of blood in the cerebrum, the cumulative force of the arterial current endeavours to expend itself in the nearest channels, of which the medulla forms one; and the absence of resistance, owing to the yielding nature of its material, readily allows the dilatation, which continuously increases the longer the epilepsy is continued.

It thus is clear that, in the relations of cause and effect, the dilatation of the capillaries must be included under the latter head, and must be considered as altogether secondary to the epilepsy.

As the actual pathological lesions associated with epilepsy, I may enumerate tumours involving surface, surface-abscess, tuberculous membranes, thickened membranes, adherent membranes, and atrophy, to which I may add, as a rare though occasional condition, surface-softening, and perhaps softening of the cord.* This synopsis is from an examination of the daily records of *post mortem* examinations at Guy's Hospital, extending over ten years; and to it I will add bony tumours projecting from the inner table of the skull and encroaching upon the surface of the brain; also ossific membranes.

Extensive disease may occur in the centre of the brain; but, unless the surface be involved, the central pathology will not be associated with epilepsy as a concomitant.

The histories of clinical cases give unequivocal evidences of tumour and syphiloma, thickening of the cerebral membranes from alcoholism and blows, and hereditary transmission of both syphilis and nervous imperfection; while fright has sometimes been set down as a cause. It occasionally happens, however, that the physician will be baffled in every attempt to find out the particular predisposing cause in an individual.

I have already observed that any cause which tends to produce an anæmic condition of the brain is sufficient to induce convulsion, exemplified in the sudden and direct depletion, as when an animal is bled to death: a more gradual drain, however, will produce the same result. For instance, menorrhagia may stand in the relation of cause to effect; also watery conditions of the blood, as in albuminuria, whether of morbus Brightii or of parturient women. Again, excess of urea, as well as poisons directly introduced into the blood, as atropine, narcotine,

* Among records of *post mortem* examinations at Guy's Hospital, is one of a case of epilepsy, in which the only lesion noticed was softening of the cord. It is highly probable, however, that this softening was extending to the cerebral surface at the time the patient died. There was no other explanation of the epilepsy in the case.