

approximates them with great force. The ataxy of all movements is much increased when the eyes are closed. He is unable to hold things, or to perform any delicate action. The sense of posture of the limbs is not affected; he can lift and move his legs best when lying in bed. The muscles are flabby and small from disuse, but not wasted; there are no paralyses of any kind, and no contractures. Muscular actions of all kinds are weak. There is no tremor. Reactions to faradaic and constant currents slightly diminished or normal. Knee-jerks present, about normal. Plantar reflexes very brisk, causing movement of the whole limb. Cremasteric and abdominal reflexes normal. The tendon reflexes in the arms are diminished. Contractions of muscles to direct percussion of their mass not well obtained. No ankle-clonus. Sensation of all kinds quite normal; he has never at any time suffered any pain. Hearing, smell, taste, and sight good. Pupils equal; act well to light and accommodation. No paralysis of any ocular muscle. There is well-marked lateral nystagmus when the eyes are moved to the outer or inner canthus, but not otherwise. The optic discs and fundi are healthy. Speech is slow and rather hesitating, and at times jerky, with elision of syllables. Intelligence good. He can repeat a number of chapters from the Bible, and is very fond of reading. There are no trophic or vaso-motor symptoms. He suffers from constipation; there is no loss of control over the sphincters; the pulse is regular; the muscles seem occasionally to be a little stiff on first being called into action. (See engraving.)

CASE 2.—Isaac A.—, aged eleven, is an intelligent boy, and looks healthy. Since the age of four his mother considers that he has been “restless,” and that this restlessness increases. He often falls down when walking, and runs in a zig-zag way—i.e., from side to side, like a drunken man. He has had no fits or any bad illness. As he sits he lets his head fall back or from side to side, and keeps his mouth open; this gives him a stupid appearance; at the same time there are rocking movements of head and trunk. Standing with feet together, there is well-marked static ataxia; movements of tendons on dorsum of feet, and slight movements of shoulders, head, and arms, whilst the feet are shifted a little from time to time; when his attention is occupied—as by counting “fifty”—these movements become more marked. He stands by choice with his feet apart. None of the movements at all resemble those of chorea. With his eyes shut there is more general unsteadiness and decided increase in the swaying movements of the trunk and head. There are occasionally slight emotional movements about the mouth, not twitching. There is slight nystagmus on extreme convergence of the eyes. The pupils are equal, and act well to light and accommodation. Sensation and muscular sense normal, muscles firm, and strength fair. Special senses normal. Speech good. The tendon reflexes in the upper limbs were not obtained. The knee-jerk on the left side was about normal; that on the right diminished, but present. Plantar and other superficial reflexes normal. His gait is a little unsteady, and he is quite unable to stand on one leg. The movements of the upper limbs show some ataxy, which becomes more marked when the eyes are shut.

CASE 3.—Caroline, aged eighteen, staymaker. Has had no bad illness; is anæmic, but otherwise appears healthy. She had a fit occasioned by a severe fright when about the age of fourteen. The catamenia appeared at fifteen; since then she has generally had a fit at the onset of a period, but never in the intervals. The fits began with a feeling as if she were turning rapidly round and round; there is then a loud noise in the head, and she becomes unconscious; the period of unconsciousness lasts for half an hour. She is often bruised by the fall, but has never bitten her tongue or passed urine in the fits. In the morning, on first getting up, she suffers from a “jumping” of the muscles and violent spasmodic movements of the limbs or body, so that she drops anything that she may be holding, and, if standing, may be thrown to the ground; she is able, however, to get up again at once. These muscular spasms are more violent during the periods, when they last till midday; on other days they pass off by breakfast-time. I was not able to detect anything abnormal on a careful examination. There was no ataxy of movement. She has been under treatment for about three months without any benefit. I have not seen the patient in any of her fits, and, from the accounts related to me by the mother, could not positively decide that they were purely epileptic in character; on the whole, the evidence went to show that

some were epileptic. The muscular contractions seemed to approximate most closely to the condition known as “myoclonus multiplex.” It may be mentioned that, whilst drinking out of a jug one morning, spasmodic closure of the jaws occurred, during which she bit off a piece of the jug and swallowed it.

I examined three other members of the family, and found them healthy in all respects. No evidence could be obtained of any ataxy of movement in the parents or grandparents, or in any of the more distant relatives. It is interesting to note the presence of insanity, diabetes, and croup in the family history, and that the father was addicted to drink. The retention of the knee-jerk in this disease is also unusual; Dr. Griffith<sup>1</sup> states that, of 143 cases, the knee-jerk was reported absent in ninety-one, much diminished in seven, diminished in two, normal in six, normal or exaggerated in one, and exaggerated in six, whilst two of the cases exhibiting exaggeration belong to two of the most typical family groups of the disease.

Clifton.

## THE DISTRIBUTION OF SECONDARY GROWTHS IN CANCER OF THE BREAST.

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AN attempt is made in this paper to consider “metastasis” in malignant disease, and to show that the distribution of the secondary growths is not a matter of chance. It is urged both by Langenbeck and by Billroth that the question ought to be asked, and, if possible, answered: “What is it that decides what organs shall suffer in a case of disseminated cancer?” If the remote organs in such a case are all alike passive and, so to speak, helpless—all equally ready to receive and nourish any particle of the primary growth which may “slip through the lungs,” and so be brought to them,—then the distribution of cancer throughout the body must be a matter of chance. But if we can trace any sort of rule or sequence in the distribution of cancer, any relation between the character of the primary growth and the situation of the secondary growths derived from it, then the remote organs cannot be altogether passive or indifferent as regards embolism.

As regards the relation of the embolus to the tissues which receive it, there is a theory, strengthened by the support of Virchow, that the embolus has a “seminal influence” on the tissues in which it lodges, and that it can make them grow like itself. But there are carefully recorded microscopic observations by Schüppel, Bizzozero, Fuchs, Eberth, Andrée, Langenbeck, and Birch Hirschfeld which go against this theory; and in favour of it I can find only a doubtful case recorded by Brodowski, with a very imaginative picture, and a case, also doubtful, by O. Weber. On the whole, the evidence is against any theory that the embolus and the tissues which receive it may be compared to generative elements acting together. As Langenbeck says, every single cancer cell must be regarded as an organism, alive and capable of development. When a plant goes to seed, its seeds are carried in all directions; but they can only live and grow if they fall on congenial soil. The chief advocate of this theory of the relation between the embolus and the tissues which receive it is Fuchs.<sup>2</sup> He urges that certain organs may be “predisposed” for secondary cancer. He observes that in cases of melanotic sarcoma of the choroid he has sometimes found sarcomatous elements inside the capillary vessels of the retina, but that they do not grow in the retina as they grow in the liver and spleen. He quotes Cohnheim’s experiments, who injected fragments of periosteum into the blood of rabbits, and succeeded in getting true tumours of cartilage and bone in their lungs; but these never attained to any marked power of growth. Cohnheim is of opinion that a healthy organ has a certain ability to resist the growth of such an embolus; and he speaks of “diminished resistance” as Fuchs speaks of “predisposition.” This theory of predisposition receives

<sup>1</sup> Internat. Journ. Med. Sciences, Oct. 1888.

<sup>2</sup> Sarkom des Uvealtractus, 1882.

some support from an examination of the statistics of fatal cases of cancer.

I have collected 735 fatal cases of cancer of the breast, in each of which a necropsy was made and recorded. It is true that among them are some cases where death was due to the operation, and some cases where death came early in the disease. But the general results remain unchanged, and are of great interest.

First, is there any associated disease which occurs more often in women who die of cancer of the breast than in other women of the same age? In answer to this, it appears that fibroid tumours of the uterus are found with special frequency in women who die of cancer of the breast. Unfortunately, most of the 750 cases are not recorded with sufficient minuteness to make one sure that the occurrence of such an associated disease would be noted. But Sibley's statistics and the Middlesex Hospital Reports give 243 necropsies, very carefully recorded. No less than 27 had fibroid tumours of the uterus, 4 had polypus of the uterus, 8 had cysts of the ovary, and 3 had dermoid ovarian cysts. Take now, from the same reports, 244 necropsies on cases of cancer of the uterus. Only 7 had fibroid tumours of the uterus, and one of these is doubtful; only 1 had polypus, 9 had ovarian cysts, none had dermoid cysts. Again, take, from the same and similar reports, 75 necropsies on women who died of cancer of some part of the alimentary canal. Only 2 had fibroid tumours of the uterus, 2 had cysts of the ovary, 1 had a dermoid cyst of the ovary, and 1 had a dermoid cyst attached to the appendices epiploicæ. These figures do seem to justify a belief that fibroid tumours of the uterus are more often associated with cancer of the breast than with cancer of the generative organs or of the alimentary canal in women.

Next, there is some reason for thinking that the same holds good for other new growths. In 182 necropsies after cancer of the breast,<sup>3</sup> there were also found bronchocele, rodent ulcer, cavernous growths in the liver, cyst in the cerebellum, and fibrous and warty growths on the body; and one patient had, besides the cancer of the breast, also uterine polypus, dermoid ovarian cyst, molluscum fibrosum, and a fatty tumour on the shoulder. But in 200 necropsies after cancer of the uterus,<sup>4</sup> there was not a single new growth of any kind elsewhere, except the uterine and ovarian growths, which occurred in both sets of cases, and of which I have just spoken. Nor was there one in the 75 necropsies after cancer of the alimentary canal in women, except one blood-cyst of the breast. It is therefore not improbable that with the tendency in women to cancer of the breast there may be associated a tendency to outgrowths of other kinds and in other parts of the body, which is not observed in women who suffer from cancer of the generative organs or of the alimentary canal.

Then as regards "metastasis." Here, too, we shall find evidences of predisposition; we shall see that one remote organ is more prone to be the seat of secondary growth than another. In cases of cancer of the breast, it is strange how often the liver is the seat of secondary cancer. From different sources, I have 735 necropsies after cancer of the breast. Of these, 241 had cancer of the liver, only 17 had cancer of the spleen, and 30 had cancer of the kidneys or suprarenals. The lungs were involved in about 70 cases; but it is sometimes impossible to say whether the lungs or only the pleuræ were attacked, nor can we doubt that in cancer of the breast the lungs often suffer, not as remote organs, but by direct extension from the primary disease.

The same propensity of the liver to become diseased is shown in cases of cancer of the female generative organs. In 244 necropsies after cancer of the uterus, the liver was involved in 35, the spleen in 1 only, the lungs in 8, and the kidneys or suprarenals in 6, one of which was by direct extension. This frequency of secondary disease of the liver is of course a familiar fact; but it acquires fresh interest when we contrast it with the immunity enjoyed by other organs. The spleen has, so to speak, the same chances as the liver; its artery is even larger than the hepatic artery; it cannot avoid embolism. Yet the liver was the seat of cancer in 276 cases; the spleen in 18 only. Such a great disproportion cannot be due to chance. For in pyæmia no such disproportion exists. I have tabulated 340 necropsies after pyæmia, and I find that abscess of the liver occurred

in 66, and abscess of the spleen in 39—a very different proportion from that of 276 to 18.

The disproportion is not so great in melanotic cancer. Taking the record of necropsies by Fuchs,<sup>5</sup> Eiselt,<sup>6</sup> and Pemberton on Melanosis, we find that in 129 necropsies the liver was affected in 77 and the spleen in 17.

Again, if we take the 735 necropsies after cancer of the breast, we find that the ovaries, one or both, were involved in no less than 37 cases; that is to say, twice as often as the spleen, and about as often as the kidneys and spleen put together. This can hardly be chance. And in two of the cases the ovaries alone of all the organs were diseased. It is of one of these two cases that Dr. Coupland says: "To evoke the fact of the physiological sympathy of two such widely removed organs to explain such a case as this is a view perhaps too fanciful to be entertained, but yet it is difficult to put such a consideration entirely out of sight."

Let us now see what is the case as regards the bones in cancer of the breast. If we consider how favourable the lymph glands are to the growth and spread of cancer, and how close the connexion is between the lymph glands and the medulla of the bones, we may look to find something of interest among the cases where the bones were involved. In the first place, there is reason for believing that a general degeneration of the bones sometimes occurs in cases of cancer of the breast, yet without any distinct deposit of cancer in them. Thus Török and Wittelschöfer,<sup>7</sup> in their analysis of 336 necropsies on cases of cancer of the breast, say: "Besides the cases where the bones were manifestly diseased, there were 8 cases of that peculiar brittleness and softness of different bones mentioned by Rokitansky, Lücke, and others, where a cancerous degeneration could not be made out." To these 8 cases we may add the following post-mortem observations from the Middlesex Hospital Reports and from Billroth.<sup>8</sup>

1. Female, aged fifty-six. Cancer of right breast and axillary glands; one nodule in the heart. "Ununited fracture of femur; an associated lesion, not due to cancer."

2. Female, aged fifty-three. Recurrent cancer of right axillary and clavicular glands, pleura, and liver. "Upper part of right thigh, old ununited spontaneous fracture. Left thigh also fractured. In moving the body the right humerus broke just above the elbow. Ribs and sternum very brittle. No sign of cancer in connexion with either of the fractured bones. Skeletal condition like osteomalacia; cortex thinned, medulla diffuent."

3. Female, aged forty-eight. Recurrent cancer in left breast and axillary glands. "Mollities ossium (carcinomatous?)."

4. Female, aged forty-six. Recurrent cancer in breast and liver. "Bones very brittle."

5. Female, aged sixty. Cancer of right breast and glands. Nodules in cranium and dura mater. "Fracture of left humerus; uncertain whether cancerous."

6. Female, aged forty-eight. Cancer of breast, axilla, and liver. "Mollities of cervical spine; lateral curvature."

Here, then, are fourteen cases, besides those noticed by Rokitansky, Lücke, and others, where cancer of the breast was associated with brittleness of the bones, or softness, or ununited fracture. Perhaps this fact may be compared with the extraordinary frequency of malignant disease in cases of osteitis deformans. However this may be, it seems certain that it is not a matter of chance what bone shall be attacked by secondary growth. Who has ever seen the bones of the hands or the feet attacked by secondary cancer? Out of 650 necropsies in cases of cancer of the breast, which give full details as to the distribution of the secondary growths, there is not a single case where the hands or the feet were affected, not one of disease of the radius, ulna, or fibula, and only one of the tibia. In contrast to this, the femur was affected, either by spontaneous fracture or by distinct deposit of cancer, 18 times; the humerus, 10 times; and the cranium, 36.<sup>9</sup> As regards the femur, the deposit of cancer seems generally to affect the medulla of the upper part of the bone; we read of it as occurring "just below the small trochanter," or "at the junction of the shaft with the great trochanter," or "at the junction

<sup>5</sup> Das Sarcom des Uvealtractus. <sup>6</sup> Ueber Pigment Krebs.

<sup>7</sup> Langenbeck's Arch., xxv., 4. <sup>8</sup> Beiträge z. Stat. der Carcinome.

<sup>9</sup> This high figure for the cranium is due to Török and Wittelschöfer, who say that, in 336 necropsies in cancer of the breast, the cranium was diseased in 33. Probably they include the brain &c

<sup>3</sup> Middlesex Hospital Reports and Billroth.

<sup>4</sup> Middlesex Hospital Reports.

of the upper and middle third."<sup>10</sup> It does not appear that the femur is so often the seat of secondary growth in other forms of cancer. Thus, in 132 necropsies in melanotic cancer, mostly of the choroid or of the skin, reported by Fuchs, Eiselt, Pemberton, and others, though the bones were freely affected, the femur suffered only in one case, and the humerus not at all.

The evidence seems to me irresistible that in cancer of the breast the bones suffer in a special way, which cannot be explained by any theory of embolism alone. Some bones suffer more than others; the disease has its "seats of election." The same thing is seen much more clearly in those cases of cancer of the thyroid body where secondary deposits occur in the bones with astonishing frequency. It is of these that Lücke<sup>11</sup> says: "Secondary tumours occur with striking frequency in the bones, both in the shafts and in the epiphyses. They may attain very considerable size and become much larger than the primary growth." He and Lebert and others have recorded such cases. I have collected notes of about 20; no less than 10 of these had masses of the growth in remote bones; in some cases the disease had attacked half-a-dozen bones at once. A contrast to this involvement of the bones in this form of cancer is found in their freedom from disease in cancer of the stomach and pylorus. In 903 necropsies in this disease, collected by Gussenbauer and von Winiwarter,<sup>12</sup> the bones were not affected in a single case; unless, perhaps, they were affected in some or all of the 11 cases, among the 903, where "general carcinosis" finally took place.

All reasoning from statistics is liable to many errors. But the analogy from other diseases seems to support what these records have suggested. The eruptions of the specific fevers and of syphilis, the inflammations after typhoid, the lesions of tuberculosis, all show the dependence of the seed upon the soil. The best work in the pathology of cancer is now done by those who, like Mr. Ballance and Mr. Shattock, are studying the nature of the seed. They are like scientific botanists; and he who turns over the records of cases of cancer is only a ploughman, but his observation of the properties of the soil may also be useful.

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## EXHAUSTION PARALYSIS.

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DR. CH. FÉRÉ, M.D. Paris, recently published an article in *Brain*, Part 42, on "Paralysis by Exhaustion," meaning paralysis produced by excessive and prolonged voluntary movement involving exhaustion of the nerve centres. Hemiplegia after repeated and violent epileptic attacks is an instance of this variety of paralysis. Excessive exercise of one arm may not only produce what is called a professional hyperkinesis, but paralysis also. Hammer palsy was described in 1869 by Frank Smith of Sheffield. It was observed in men who had to work for many hours with a small hammer which had to be rapidly wielded. In these cases the individual was usually anæmic, and the paralysis was hemiplegic in distribution, though more especially affecting the arm; aphasia and sensory disturbances were also occasionally present. In one case, in addition to marked paresis, there was inability to write, and cramp increased when the patient tried to use a hammer. Dr. Féré relates two cases of exhaustion paralysis occurring in his practice. One patient, a blacksmith, after two hours' extra work, noticed that the hammer was unusually heavy and that his hand felt numbed. The next day his right arm was powerless and the right leg weak. Dr. Féré found that he had hemiplegia, the face being affected, and there being considerable anæsthesia on the right side. The patient had almost completely recovered in three weeks. In the second case, a young lady with a neurotic family history, after practising at the piano for nine hours, noticed that her hand was heavy and clumsy; the leg was also

weak and both limbs anæsthetic. In a fortnight recovery was almost complete.

I have had the good fortune to meet with a very typical instance of exhaustion paralysis at the Birmingham Workhouse Infirmary. A woman, fifty-one years of age, was admitted into the infirmary on Sept. 22nd suffering from cramp and paralysis of the right leg. She had followed the occupation of cook in a large factory, and had been accustomed to standing for many hours a day, the usual hours being from 6 A.M. to 9 P.M. She would perhaps sit down for a few minutes to her meals, but certainly for not more than half an hour in the day. Besides being constantly on her legs, going up and down stairs, she had to lift and carry heavy weights. She had worked at the factory for some months, and had always left her work completely tired out. Latterly she had noticed that her right leg felt tired towards the end of the day. A few days before her admission, her mistress having been taken ill, she was obliged to stay even later to do overtime, as she called it; and on Sept. 21st, as she was walking home from her work, she was seized with numbness and cramp in the right leg and foot, and was obliged to be carried home, being unable to walk or stand. During the night she was seized every few minutes with violent cramps in the right lower extremity, which occasioned much pain and prevented sleep. When I saw her on the 22nd I found that the right leg was completely paralysed, and observed two or three attacks of violent spasm of the muscles of the thigh and leg. The patient complained of numbness of the whole of the right leg, and of the right side of the body up to the under surface of the right breast. There was distinct but not complete anæsthesia, tactile, thermal, and painful impressions being only slightly perceived in the right lower extremity. The muscular sense was also much impaired, for on the left side she could distinguish between one-ounce and two-ounce weights, while on the right side she could not distinguish between one-ounce and six-ounce weights. The plantar reflex was lost on the right side, but the knee-jerk was excessive. There was no ankle-clonus. There was no bladder or rectal trouble, no retinal changes, no fever, and no albuminuria. There was no neurotic family or personal history, and no trace of hysteria about the woman. She had ceased menstruating for some years, and had enjoyed good health, though she had occasionally noticed numbness in her right hand. The right upper extremity was unaffected, and there was no trace of any facial paresis and no cerebral disturbance. A hypodermic injection of morphia and atropia greatly allayed the attacks of spasm. A mixture of bromide of potassium, chloral, and belladonna was prescribed, and the limb was gently rubbed. On the 23rd the patient was free from cramp, and could lift the leg from the bed, though sensation was still impaired. She improved daily, and in ten days' time was able to walk about, and was discharged perfectly well.

There is no doubt that this was a typical case of functional akinesis or exhaustion paralysis; and it is evident that not only is there a professional hyperkinesis such as writer's cramp, telegraphist's cramp, &c., but also a professional akinesis or exhaustion paralysis, and that there is a close association between them, as shown by their occasionally occurring together in the same subject. A point worthy of notice in the history of the reported cases of exhaustion paralysis is that, though the individual may have worked very hard for years, nothing happens until there is a call for still further effort, when the machinery at once fails. The quick recovery of these cases of exhaustion paralysis contrasts very strongly and favourably with the tedious and slow recovery observed in cases of professional hyperkinesis. Exhaustion paralysis must be added to the list of functional paralyses and its existence borne in mind, for a mistaken diagnosis may readily be made, the paralysis being very complete and often hemiplegic in distribution, with implication of the facial muscles. The functional paralyses described in text-books are (1) hysterical, (2) ideal, (3) reflex, (4) malarial, and (5) anæmic. There were no indications of hysteria in my case, the patient being a hard-working and very matter-of-fact kind of individual, not at all of the neurotic type, and extremely anxious to get out of the infirmary to go to work again. The cramps occasioned very severe pain, and in the intervals between the attacks of cramp the leg was completely paralysed and flaccid. She complained of severe pain round the right side of the body under the right breast

<sup>10</sup> See, for four more cases, Ormerod's Clinical Collections, p. 202, and C. Hawkins' Contributions to Pathology, ii., 124.

<sup>11</sup> Krebs der Schilddrüse. <sup>12</sup> Langenbeck's Arch., xix., 372.