somes results of spinal injury.

It is most unlikely that a less differentiated form (cow-pox), also emanating from the common ancestral stock, should attain to the most exalted virulence in a single individual, and, per saltum, declare itself as small-pox, as the dissentient Commissioners insist that it ought to do.

Clinical lecture

on

A case of localised myelitis.

Affecting the fifth lumbar and the sacral segments of the spinal cord, the result of a slight traumatic injury;

and

A case of paralysis of all four limbs, due to a spinal injury.

Delivered at the Edinburgh Royal Infirmary

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(Concluded from page 112.)

Although we have arrived at the conclusion that the lesion is situated within the spinal cord, we have by no means exhausted the anatomical diagnosis. We have next to endeavour to determine the exact part of the spinal cord (in its vertical and transverse diameters) which is involved. This point of diagnosis is decided by observing the exact distribution of the symptoms (the motor paralysis, sensory derangements, disturbances of reflex action, the vasomotor and trophic derangements).

The spinal cord consists of a series of segments placed one above the other; each segment consists of two symmetrical lateral halve to which a pair of spinal nerve roots is attached, and each segment of the spinal cord may be regarded as a separate spinal cord for the portions or areas of the body to which the spinal nerves connected with it are distributed.

Now, as I pointed out in the first edition of my book on the spinal cord, published long ago a good many years ago, the essence of the clinical examination of the spinal cord consists in the examination of the motor, sensory, reflex, vasomotor, and trophic functions of each of the individual segments in detail.

In this case there is no difficulty in coming to a conclusion as to the exact part of the spinal cord which is affected, for the symptoms are so remarkably localised to the areas of distribution of certain spinal segments. This case may in fact be regarded as a physiological experiment made by disease in the animal man. It is rare to meet with cases of cord disease. I refer, of course, to indiscriminate lesions in which the symptoms are so accurately localised and limited in their distribution, and it is for this reason that cases such as this are of so much scientific interest and importance.

It is by the careful observation of cases such as this that we are enabled to increase and advance our knowledge of the functions of the spinal cord. The case is an excellent illustration of the importance of clinical observation, and confirms the view that I am never weary of expressing—that the observation of the effects of disease in man is, for the purposes of human physiology (and that, as it is remembered, is the physiology which chiefly concerns the practical physician and the practical surgeon), quite as important—in fact when we are fortunate enough to meet with cases in which the lesion is so localised and the symptoms are so sharply defined as they are in this case I would say much more important—than experimental observations on the lower animals. But I must not allow myself to be diverted into a discussion on this point—the value of accurate clinical observations as a means of elucidating the physiology of the nervous system of man.

In dealing with such a case as this, the first point is to get the facts accurately. This necessitates care, time, much patient clinical observation, and above all the most scrupulous exactness and truthfulness. Dr. Colman and I have given

May 7, 1898.
much time to the investigation of this case. As the result of our observations, we have determined that the motor paralysis is practically limited to the muscles below the knee. There is, as I have already told you, complete paralysis of all of the muscles below the knee, and of the glutei maximus muscles, some paralysis of the bladder and rectum, and some, though very slight, paralysis of the muscles of the thighs. The paralysis of sensation involves the feet, the lower part of the legs, the scrotum and penis, the perineum, a saddle-shaped area on the buttocks, and a narrow strip on the adjacent part of the back of the thighs (see the areas marked black in Figs. 1 and 2). The disturbance of reflex action involves the plantar and sexual reflexes (which are completely destroyed), the vesical and rectal reflexes (which are impaired but not completely destroyed), and in a slight degree the knee-jerks (which are diminished in intensity). The cremasteric reflex on both sides is, you will remember, quite unaffected. The vasomotor and trophic disturbances are limited to the parts in which the sensory paralysis is present.

Now, it is obvious, from this distribution of the symptoms, that the lesion involves the lower end of the spinal cord (the last lumbar and the sacral segments); the cervical, dorsal, and the greater part of the lumbar enlargements are quite unaffected. There is no disturbance of function in parts supplied by nerves coming off from the cervical and dorsal regions of the cord. The lumbar enlargement may require a little further discussion. The nerves coming off from the lumbar and sacral segments of the spinal cord are distributed to the lower extremities and to the pelvis. The exact motor and sensory distribution of the different nerve roots connected with the lumbar and sacral segments of the cord is (approximately) shown in Figs. 3, 4, and 5.

![Diagram of spinal cord](image-url)

Figs. 3 and 4—Outline chart of sensitive areas of the skin (after Theodor Kocher). L 1 and 2, area of distribution of the first and second lumbar nerves; L 3, area of distribution of the third lumbar nerve; L 4, area of distribution of the fourth lumbar nerve; S 1, 2, 3, 4, areas of distribution of the first, second, third, and fourth sacral nerves respectively.

From the detailed description of the symptoms present, which I have already given you, there is no difficulty in concluding that the lesion involves the first, second, third and fourth sacral segments of the spinal cord, and, to a slight extent, the fourth and fifth lumbar segments, the first, second and third sacral segments being more particularly involved.

The next question which has to be determined is what part of the transverse section of the spinal cord is involved. Each segment of the spinal cord consists of two symmetrical lateral columns, each half of which is partly of grey and partly of white matter. The grey matter of the anterior horn contains the multipolar nerve cells, which are the trophic centres for the muscles and the centres for reflex action. The grey matter surrounding the central canal has important functions to perform. As we shall presently see, the transmission of pain and heat and cold. The grey matter of the posterior horn, perhaps, exerts a trophic influence upon the skin.

The white matter consists of various tracts which have a definite physiological function. Now, in this case there is not only paralysis, but there is extreme atrophy and absence of the faradic contractility in the muscles which are completely paralysed—the muscles supplied by nerves coming off from the first and second sacral segments. This seems to show that the lesion involves, and has extensively destroyed, the grey matter of the anterior horn—at all events, in the first, second and third sacral segments, the segments which supply the calf muscles, the glutei muscles, the peronei muscles, the muscles of the scrotum, the saddle-shaped muscles of the foot, the intrinsic muscles of the foot, and, perhaps, the muscles of the penis.

The paralysis of the bladder and rectum appears to be incomplete; the muscles concerned in the production of these important reflexes receive their motor supply from the fourth and fifth sacral segments. It seems therefore to conclude that the grey matter of the anterior horn in the fourth and fifth sacral segments is not completely destroyed.

With regard to sensation, tactile sensations are conducted up the white matter in the lateral columns, whereas painful sensations and sensations of heat and cold appear to be conducted up through the central grey matter. Now, it is important to observe that in this case the tactile sensibility is less impaired than the sensibility to pain, and the sensibility to pain less impaired than the sensibility to heat and cold. It is reasonable therefore to conclude that the lesion affects the central grey matter more than the white columns; but it is probable that the lateral white columns in the sacral segments are, to some extent, affected. There is complete anesthesia of the skin of the perineum, external genitals, and of a saddle-shaped area on the buttocks and adjacent parts of the back of the thighs—these parts are supplied by the third and fourth sacral segments (Kocher)—and of the outer parts of the feet and lower part of the leg (these parts are supplied by the first and second sacral segments, according to Kocher, by the fifth lumbar according to Thorburn, by the fifth lumbar and first sacral segments according to Head).

We may therefore conclude: First, because of the manner in which the paralysis of motion, sensation, and reflex action is distributed, that, as regards the vertical extent of the lesion, the first, second, third and fourth sacral segments are very markedly involved, and the fifth and fourth lumbar and the fifth sacral segments are in a less degree involved.

Secondly, because of the extreme muscular atrophy and the presence of the reaction of degeneration in the muscles supplied by the first, second, and third sacral segments (the muscles of the legs and feet and the glutei maximus muscles) that the grey matter in the anterior horn in these segments is markedly affected.

Thirdly, because of the complete anesthesia of the skin of the penis and scrotum, of the saddle-shaped area on the buttocks and on the outer parts of the feet and legs, that the white matter in the lateral columns of these segments is perhaps also implicated, though it may quite well be that the anesthesia is due to a lesion of the grey matter (the nerve fibres which conduct tactile impressions into the cord being involved as they pass through the grey matter in order to reach the lateral columns on the opposite side of the cord).

Fourthly, because of the disassociated character of the anesthesia (the fact that the warming anesthesia is more extensive and more deeply distributed than the tactile anesthesia, that the central grey matter in these segments is more involved than the white lateral columns).

It would be difficult to imagine a case of spinal cord disease (in which the lesion was an "indiscriminate" and not a...
SOME RESULTS OF SPINAL INJURY.

Fig 5.—Diagram illustrative of the muscular distribution of the lumbar and sacral nerve roots (after Theodor Kocher).

Lesion is a "system" or an "indiscriminate" lesion; and the constitutional peculiarities and tissue tendencies of the individual patient.

Figs. 6 and 7.—Area of distribution of the tactile anesthesia at the date of the patient's discharge, in the case of G. A. described in the text.
By the observation of these points an experienced observer who is acquainted with the different forms of lesion which occur in the spinal cord, with the symptoms to which they give rise, and with the course which such lesions and such symptoms pursue, has usually no difficulty in making a pathological diagnosis. Pathological Diagnosis. — Up to the time of the accident the patient was healthy but alcoholic. He then received the injury which I have described. This injury was slight, nevertheless it was attended by the production of immediate symptoms: namely, that the muscular weakness in the left leg was due to a “twitting” sensation in the right ankle, and a sensation of numbness and coldness in the right foot and lower part of the right leg. There was, you will observe, no evidence of local injury to the ankle-joint, although the pain is suggestive of this, and there was no evidence of any direct lesion to the back. The fact that immediately after the accident the patient complained of numbness and coldness in the right foot and lower part of the right leg seems to show that the weakness in the ankle was not merely the result of a local injury to the ankle and leg, but that it was due to a lesion of the spinal cord. The progressive course of the weakness (paralysis) and the gradual invasion of the opposite (left) leg are corroborative of this view. At the end of four months the left ankle became affected, and in course of time the paralysis had become more extensive and very marked — almost as complete as it is at the present time — affecting the muscles of both legs below the knees and the glutei muscles. How far this condition was predisposed to the occurrence of the lesion it is impossible to say; but it is not unlikely that it may in some degree have done so.

We may take it for granted, then, that the injury produced some alteration in the sacral portion of the spinal cord, which was the starting point of the lesion which is now present. The lesion seems to involve both the grey and the white matter, but especially the grey matter; it is very localized in its vertical extent; it is, in short, an indiscriminate and not a system lesion. So far as I was able to discover, and with the fact, it is essentially chronic in character. There are no symptoms suggestive of a new growth (tumour) within the cord; and there are no symptoms, as I have already pointed out, indicative of a "coarse" lesion on the surface of the cord or of disease of the spinal bone.

Taking all of these facts into account, the most likely supposition seems to me to be that at the time of the accident a minute capillary hemorrhage took place into the grey matter of the right side of the cord in the segment corresponding to the right ankle, probably the first and second sacral segment; and that this minute capillary hemorrhage was the starting-point of a sclerosis, or a chronic myelitis if you like, which gradually extended, first invading the opposite (left) side of the same (right) column, and finally involving the muscles of the legs, the lesion probably lying in the spinal cord, and gradually involving the adjacent segments immediately above and below the segment first affected.

Two days ago I had the opportunity of observing the patient to two distinguished American neurologists — Dr. Sachs and Dr. Joseph Collins of New York — and of discussing the case with them. Dr. Collins suggested that the lesion was perhaps a dissecting hemorrhage which had extended down the cord and given rise to the formation of a cavity in the grey matter, and that a second hemorrhage had probably occurred when the symptoms became aggravated as the result perhaps of a process of acute myelitis. This may of course have been the case, but a sclerosis or very chronic myelitis seems to me much more probable. The skin and glandular tissues, even in the case of a patient suffering from acute myelitis, are frequently preserved, whereas in the case of an acute myelitis there is usually a loss of sensation, although the skin is usually preserved. But it seems to me that a patient suffering from acute myelitis, if he is not very seriously injured, will not continue to make much progress, and is likely to recover in a year or two, if he does not die during the acute stage. It seems to me that the symptoms in this case resemble very closely the symptoms of an acute myelitis, and are therefore very suggestive of a "railway spine." This is a very important point, for until recently it was very generally, but quite erroneously, supposed that the nervous symptoms which so frequently follow railway accidents and injuries were the result of concussion of the spinal cord. The lesion is now completely excluded. Further, this case seems to show conclusively that a slight injury may be the starting point of serious organic disease of the spinal cord.

TREATMENT. With regard to treatment, this must be directed to getting the bedsores healed, paying attention to the bladder and rectum, and to endeavouring, if possible, to limit the further spread of the lesion.

In many cases of traumatic paraplegia in which the lesion is situated on the surface of the cord and is due to hemorrhage and thickening and inflammation of the membranes, marked benefit results from the free application under chloroform of the actual cauterizer. In this case, in order to be situated within the spinal cord, I hardly think that counter-irritation over the spinal column is likely to be of much avail.

Rest in bed, iodide of potassium, arsenic, nitrate of silver, salicylic acid, and massage of the muscles of the thighs (for I have very little hope that any marked improvement will take place in the condition of the legs), appear to me to be the most appropriate remedies. Further, let me point out that great care must be taken to avoid irritation of the anesthetic areas. In detailing the notes of the case, I have stated that on more than one occasion the skin was severely burned by the application of a hot bottle. The resistance of the skin in the anesthetic areas is very markedly impaired. Ulcers and bedsores are very easily produced, and after they have been produced show little tendency to heal. This tendency to the production of bedsores is a point which should always be kept in view in the management of cases of spinal myelitis. I have already told you that the patient has been placed on a water bed, and that the nurses have been instructed to see that he is kept scrupulously clean and dry.

Before leaving the case, let me emphasise the fact that in this case, in which the lesion had its starting point in an injury — a jar to the spinal cord and spinal column, this produced the actual cauterizer in this case, in order to be situated within the spinal cord, I hardly think that counter-irritation over the spinal column is likely to be of much avail.

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cord, and in such cases the disease is not attended with any of the nervous symptoms which follow railway accidents and injuries.

Note as to the Subsequent Progress of the Case.—The progress of the case has been very rapid. The lesion was supposed to have been in the cord, in fact the patient has slowly but steadily improved in several respects. The condition of the patient on his return to his home, 18^o, which had been attended by medical men, had been the same for several weeks; the paralysis of the bladder and rectum has almost entirely disappeared: the greater portion of the muscles of the lower and upper extremities have completely recovered, and the patient is able to walk freely, but his hands and legs are still flabby. The patient's strength and motion have been improved by the use of the knee-harness, and the patient is now able to walk about his house, but he is still in a condition of inactivity.

Before concluding this lecture I wish to show you another case of paralysis due to spinal injury which, curiously enough, happened to be in the ward at the present time, for it presents some remarkable points in the case which have not been considered, and it illustrates some of the general statements which I have made in commenting on the first case.

The following is a brief abstract of the more important points in the medical history:

Case II. Complete Motor and Sensory Paralysis of the Upper Extremities and Temporary Motor Paralysis of the Lower Extremities due to Dislocation or Fracture of the Fifth Cervical Vertebra: Temporary Recovery after removal of the Spinal Cord and permanent Stiffness of the Neck remaining.—F. B., aged 46, a carter, was admitted to Ward 39, Edinburgh Royal Infirmary, on June 14th, 1897, suffering from paralysis of the arms. The patient, who is a healthy, able-looking man, states that he was quite well until eight months ago, when, on October 22, 1897, he sustained a fall which was followed by present trouble. He was getting into his cart, having one foot on the wheel, when he fell on to his back on the hard macadamised road. He was not immediately prostrated, but immediately he became paralysed. Immediately after the accident he experienced pain in the back of the neck and shoulder-blades. He had two or three spasms, unable to move either his arms or his legs, and was able to call out for assistance. A gentleman who was passing raised his arms above his head, but he did not height. The paraplegia moved on; thus the patient now was placed on a stretcher and carried home. There was a small superficial cut on the back of the neck, and some swelling of the lower part of the neck, but, so far as he knows, no other appearance of injury. For a day or two after the accident he felt little or nothing wrong with the neck; it then became painless. For several weeks the pain in the neck was agonising. He states that for three weeks he was fevered with the pain.
tions were (probably) due to a lesion of the grey matter; in the second to a lesion of the motor nerve roots. Consequently in the first case the prognosis as regards recovery from the paralysis is very bad, in the second case very good.

In the first case the paralysis, which was, I believe, due to a lesion of the grey matter, has been throughout its natural "flaccid" phase in the second, in which the paralysis was, I believe, due to an injury of the motor nerve roots, there had been marked symptoms of motor irritation (rigidity, lurchings, and spasms).

In the first case sensory disturbances which have gradually developed have persisted; in the second case they have been completely recovered from in the course of a short time (three weeks).

In the first case there has been some affection (paralysis) of the bladder and rectum and marked trophic disturbances; in the second case these symptoms have been entirely absent.

The first patient had for years been a hard drinker; the second patient has always been a steady man, never given to alcoholic excess.

Note as to the Treatment and Subsequent Progress of the Case. The patient was treated with electricity, massage, and hypodermic injections of strychnine. He rapidly improved, and was discharged on July 24th. The grasping power of the hands at this date was as follows: Right = 75, left = 92. The movements at the shoulder-joint were much more freely performed than before. The date of his admission was January 16th, 1897; when seen it was noticed that the shoulder are much more free, and the muscular power and nutrition much improved; the neck is still stiff, but the immobility is rather less than it was.

NOTES AND REFERENCES.

1. It must be remembered that alcoholic peripheral neuritis with paraplegia, shooting pains are complained of, and hyperesthesia of the sole and muscular tenderness (on pinching the calf muscles) are very general in persons who have been drinking heavily. The present authors are not agreed as to the exact sensory distribution of the spinal nerves connected with the tarsal and sacral segments of the cord. The Läsionen des Rückenmarkes, Wundersachen der Wirbel säule, Figs. 86 and 87, Mitteilungen aus den Grendgebieten der Medicin and Chirurgie, erster Band, viertes Heft, p. 655.

TWO CASES OF OPHORECTOMY FOR INOPERABLE BREAST CANCER.*

By W. Watson Cheyne, F.R.C.S., F.R.S., Professor of Surgery, King's College.

The very remarkable success which attended Dr. Bealton's first case of ophorectomy for inoperable cancer of the breast has led to the operation in two cases in which it is of importance that any cases in which this operation has been done should be reported, with the view of ascertaining what value, if any, attaches to it. I need not apologize for reporting these two cases, as they have performed a remarkable operation.

Case I. - Mrs. S., aged 34, admitted to King's College Hospital on October 23rd, 1896. The history of the case was that the patient was well until about six weeks before admission, when she noticed a swelling in her right breast, which rapidly increased in size. The breast was removed at a country hospital, and she was told that it was a cancerous tumour. A year later she went back to the same hospital and some enlarged glands were removed from the axilla. Three weeks before admission she felt pain along the old scar, noticed some discharge, and found that there was an ulcer in the mid-axillary line.

On admission, the patient seemed in fairly good condition, but complained of pain in the region of the breast and between the axillary folds. On examination, a scar was seen running in the space between the fifth and sixth rib curving upwards towards the base of the axilla and a little to the inner side of the angle of the fifth rib, there was a red and slightly ulcerated and thickened part in the scar. Between the axillary folds in the scar itself were two small nodules, and the left side of the scar towards the axilla was an ulcer about the size of a shilling, with considerable induration of the skin, and redness of the skin; in the axilla there was a hard tender mass, occupying the greater part of the space, somewhat flattened and firmly adherent to the side of the chest, so that it could not be moved in any direction; it filled up practically the whole of the axilla. There were numerous glands in the posterior triangle of the neck, some of which were large, especially one towards the outer border of the edge of the sternomastoid muscle. There was evidence of internal deposits.

The cause of death was nearly one in two, too good could result from an attempt to remove the disease; not only was it very extensive but it was also very adherent, and, judging from the large size of the glands in the lower part of the posterior triangle of the neck, it was almost certain that other enlarge glands were present in the same region. The operation was therefore put before her, and, having been thoroughly explained to her, she consented and desired to have the operation performed. Accordingly, on October 28th, both ovaries and tubes were removed, and at the same time a small portion of the ulcerated patch was cut away for microscopic examination.

There is nothing whatever to note about the progress of the ophorectomy; the patient went on perfectly well. She was discharged from the hospital on December 23rd; at that time there seemed to be distinct improvement in the cancer but as the neck mass was reduced to a considerable extent; the mass in the axilla felt softer and not quite so adherent; the glands in the neck were noticeably smaller; she was in excellent health.

On March 19th, about four months and a half after the operation, she herself telegraphed the report taken:-A great deal of the skin infiltration has disappeared, but there still remains a small patch of ulceration about the size of a threepenny bit at the posterior part of the original mass, and there is a small scab on it; the mass in the axilla is distinctly smaller and softer, and is now freely movable; the glands in the neck are very much fewer; they are only about the size of split peas, and, indeed, the large ones at the lower part have entirely disappeared. The patient is doing very well, and there is no friction to be heard at the lower part of the left pleura, which she herself can feel on exertion, but there is no pain or other symptom associated with it. It should have been said that thyroid tabloids were also given while she was in the hospital, and she continued them after her discharge, but the administration was irregular once she left the hospital. Improvement still continued for a considerable time, but towards the end of May she did not feel so well, and on seen on June 4th the following is the note:—The growth has now been distinctly increased in size, the mass has been extended, and is nearly as large as it was originally; the mass in the axilla is larger than on the last occasion and becoming more adherent, but still it is not quite so extensive nor so adherent as at the time of the operation. No regards the neck increased growth is very apparent; the glands are not quite noticeable and the large glands have again reappeared; indeed, the condition in the neck seems worse than it was before the operation; the pleuritic friction still continues and the patient feels weakly, but there are no special signs of internal deposit.

She had to give up her situation shortly after this on account of increasing weakness and pain, and I have not seen her since, but Dr. Bennett, of Staplehurst, sent me an account of the later condition of the case in March. At that time the ulcer below the axilla had increased greatly in extent, reaching from the anterior to the posterior fold of the axilla; it was about an inch and a half broad. A nodule in the pectoral muscle had appeared and increased in size. There was a considerable mass in the neck, and one of them the size of a walnut. The patient suffered great pain, and had to have frequent doses of morphia.

Case II. - Mrs. F., aged 51, admitted to King's College Hospital on May 23rd, 1897. The patient said that about nine months ago she found a swelling in the left axilla; for the last two months she has had shooting pains down the arm and along the side. About two months ago she noticed a small swelling on the right side, and also swellings under her arm. On examination a large nodular tumour was found in the left breast, chiefly towards the inner side, and also a nodule on the right side, in the upper edge of the breast and apparently superficial to it; the axilla was full of glands, which were mixed together and of considerable size, and evidently adherent to the tissues around; there was also a mass of glands above the clavicle; small hard glands could also be felt in the right axilla; there was a gland in the left axilla, and one near the side of the sternomastoid muscle, both of these were of slight discharge from both nipples. The patient was extremely weak; she had not undergone an operation, and she was told that it was purely a case in which no radical operation could be performed with any chance of success.

The question of ophorectomy was therefore explained to her, and she said that she would undergo the operation. On May 26th, both ovaries and tubes were removed. The wound healed well, and the patient was discharged from the hospital June 26th. It will be seen that there was a slight improvement, but not to any marked extent; the tumours seemed to feel softer and flatter, and not to have progressed at all; in fact, some of the glands had become smaller in the course of the next few months, but was found to be gradually getting weaker and thinner, and no real improvement could be made out.

Thyroideoids were given in the first instance. Her condition steadily got worse, though the glands appeared a little smaller.