ON THE EXACT SENSORY DEFECTS PRODUCED BY A LOCALISED LESION OF THE SPINAL CORD.

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THE following case seems to me worthy of record, for (1) it helps us to learn over what areas of skin sensation is perverted when there is a localised lesion of the spinal cord, and it is thus of importance in connection with Dr. Head's researches; (2) it illustrates what forms of sensation are the first to disappear when the cord is compressed, and it is therefore an aid to the elucidation of the paths of sensory impulses in the cord.

(1) The cord was compressed opposite the seventh dorsal vertebra, that is to say, at the point of origin of the eighth dorsal nerve. We ought, therefore, according to Dr. Head, to have found that the patient had loss of sensation below the upper margin of her eighth dorsal (middle epigastric) area. Reference to the figure will show that this was so on the right side. On the left there was loss of sensation below the upper limit of her ninth dorsal or supra-umbilical area. This difference on the two sides is probably to be explained by the fact of the cord not being compressed at exactly the same level on the two sides. There can, I think, be no doubt that this case strongly supports Dr. Head.

(2) We may from this patient perhaps learn something about the paths of the upward conduction of sensory impressions. The whole cord was compressed opposite the seventh cervical vertebra, but probably the lateral parts were much more compressed than the posterior, for on the sides of the cord there was some thickened inflammatory material which did not extend further back than the posterior roots.

In the first place, it will be noticed that over the area of skin corresponding to the whole of the cord below the point of compression, pain was interpreted as touch. This fact has often been observed before in similar cases, but nevertheless it is frequently overlooked, and cases are reported as suffering from cutaneous anæsthesia, when in reality they are only suffering from analgesia. Many authors assume that impressions of pain are different from those of touch, and that they ascend in different parts of the cord, founding this belief chiefly on cases such as the one here recorded. According to them, painful impressions are transmitted up in the lateral part of the cord, and simple sensations of touch in the posterior part. It is probable, however,¹ that "pain is no especial quality of sensation, but merely a special designation for the painful or unpleasant feeling that accompanies a very intense dermal sensation." On the first view we must assume that the pressure opposite the seventh dorsal vertebra so compressed the cord that it destroyed the functional activity of those fibres in it which transmit painful impressions; or on the second that those fibres in the cord which conduct sensations of touch were so compressed that their functional activity was lowered. This view is certainly supported by the fact that tactile sensibility was impaired—although it is true that the slightest touch was recognised—for the patient could not distinguish silk from velvet by the touch when they were applied to the feet, although a healthy person was able to do so, and with our patient it was necessary to remove the points of a pair of compasses before she recognised them as two, very much further apart than was necessary when the points of the same compasses were applied to the same parts of the skin of a healthy woman. But in favour of the first view is the fact that there is very strong reason for supposing that the lateral portions of the cord were more compressed than the posterior, and previously recorded cases of localised damage to the spinal cord appear to indicate that painful impressions are conducted up in the lateral columns, and those of touch in the posterior. I very

¹ Ziehen. "Physiological Psychology." Eng. trans., p. 133.

much doubt, however, whether in some of the previously recorded cases the statement that touch was unimpaired is as valuable as it seems, for observers have often been content with saying that touch was normal when the patient could feel the slightest touch. But our patient could do this, nevertheless it was shown by the silk and velvet, and compasses, that her touch certainly was not normal.

Over the whole of the analgesic area the patient could not distinguish between moderately hot and moderately cold objects applied to the skin, although she could between very hot and very cold. It has been observed in other cases of damage to the spinal cord, that when the capability of perceiving painful impressions, as such, is abolished, there is impairment or absolute abolition of temperature sense, and from them it has been inferred that sensations of pain and those of temperature are conducted in closely contiguous parts of the cord, and that as pain is probably transmitted upwards by the lateral columns, so probably are sensations of temperature.

It is especially interesting that both forms of muscle sense were unimpaired in this patient. She could tell an addition of 1 oz. in 12 oz. suspended from the ankle, and when I myself was tested I could do no better. Also she knew in what position her limbs were placed when she was blindfolded and I put them in any particular posture. These facts to some extent harmonise with the belief that the impressions of muscular sense and common sensibility ascend together in the posterior part of the cord, for this patient could feel the slightest touch, although in some particulars the sense of touch was impaired, and therefore on this view we must suppose that this part of the cord to some extent felt the effects of the compression.

The assignment of the conduction of pain and temperature to the lateral portions of the cord, and of muscle sense and touch to the posterior part, while no doubt it derives support from cases in which the cord was compressed from without, is difficult to understand when we study syringomyelia in which the pressure is exerted from the centre of the cord towards the periphery, for in them also

the power of appreciating sensations of pain and temperature is lost before the power of appreciating those of touch and those of muscle sense. But syringomyelia is often more marked at the posterior part of the cord than the lateral, so that we should have expected that sometimes at least the ability to distinguish tactile and muscular impressions should be lost before the ability to tell those of pain and temperature.

The last point to which I would direct attention is that there was no delay in perceiving sensations of touch or temperature, although both these were impaired, which seems to me very difficult of explanation, for we should have expected that if some fibres were so damaged that they could not conduct impressions accurately, neither would they be able to conduct at the normal rate.

On the whole, therefore, although at first sight this case supports the teaching that sensations of pain and temperature ascend in the lateral columns, and those of touch and muscle sense in the posterior, on looking more deeply we see some phenomena of it which are not explained on this hypothesis, viz.—the inability to tell silk from velvet, the wide separation of the compasses necessary before the points were distinguished as two, and absence of delay in the conduction of tactile and normal sensations. Facts like these should make us pause before assigning definite tracts to sensory impressions.

Sarah Pretlove, aged 54, admitted into Miriam Ward, Jan. 12, 1893. Clinical assistant, Mr. A. H. Leete, B.Sc. The family and previous history are unimportant.

Present illness.—This began three months ago with a pain which encircled the trunk on each side from a spot between the umbilicus and the ensiform cartilage. There was no vomiting, and the pain was not increased by food. About a month ago the patient noticed a few slight jerks in the leg, and that she staggered when she tried to walk. This increased till the present time when the patient drags the legs so that she cannot walk. She says that the legs always feel cold. Within the past three months a swelling has developed in the mid dorsal region of the spine.

Condition on admission.—The patient looks feeble and older than she really is.

Motor Symptoms.—There is no paralysis of the lower extremities, and the power of flexing the knee joints is good, and the thighs can be flexed on the abdomen, and the feet can be bent, but both lower extremities are in a typical spastic condition, and show the clasp-knife rigidity when extended at the knees. It is the spasticity which prevents the patient from walking.

Sensory Symptoms.—(1) Tactile Sensibility. There is no delay in perceiving touch, nor any impairment of the power of localisation anywhere. But there is some impairment of tactile sensibility, for the patient cannot by means of the soles of the feet distinguish silk from velvet, although it was found that a healthy person could. Further, the sense of touch (as tested by the minimum distance at which the points of contact of the points of a pair of compasses are perceived is two) is impaired thus:—

On soles of feet minimum distance	...	...	= 1 in.
„ right leg just below knee	...	...	= $1\frac{1}{8}$ in.
„ left leg just below knee	...	...	= $1\frac{1}{8}$ in.
„ abdomen	...	...	= over 3 in.

(2) Common Sensibility. There is no delay in sensation, but there is impairment, for if the patient be pricked with a pin she interprets the experiment as a mere touch. This analgesic area extends from below a line following the downward slope of the 9th left intercostal and the 8th right intercostal nerves down to the commencement of the lower extremities on both the back and front of the trunk (see fig.) The upper limit is absolutely definite on the front and sides. On the back it is slightly indistinct. It extends over the whole of the lower extremities except a few small areas where the prick of a pin gives rise to a sensation of pain; there is one such area on the outer aspect of the middle third of the right thigh, and also one in a similar position on the left thigh.

No definite hyperalgesic area can be demonstrated, but it is probably not entirely absent. Attempts to locate it definitely lead to no constant result, but the results always lay between the 6th and 9th nerves. Pressure on the 6th right and 7th left intercostal nerves always caused pain. There is a very definite and constant girdle pain encircling the body. When asked to localise it the patient always places her hand over the epigastric and hypochondriac regions. The pain she describes is always present, and is of a dull heavy character.

(3) Temperature. There is no delay in perception, but over the whole of the analgesic area there is impairment of power to distinguish between heat and cold, but the power is nowhere

absolutely lost, nor is it ever perverted. On the chest and arms above the analgesic area there is no impairment.

(4) Muscle Sense. The patient when blindfolded can always tell the position her lower limbs are in when at rest, and also the position in which an observer may place them. When a broad bandage is placed round the ankle and a weight suspended from it, the least increase the patient could detect on either side was 1 oz. added to 12 oz.

Reflexes. The knee jerks are increased, the plantar reflexes are lively, the epigastric reflex is absent. Ankle clonus is present.

Micturition and defæcation are normal. There are no trophic changes.

Spinal Column. There is a considerable backward projection of the 7th to 10th dorsal spines, which form a prominent convex swelling.

The respiratory, circulatory, alimentary, urinary systems are normal.

January 20.—Mr. Lane cut down upon the swelling in the back. The laminae of part of the 6th, of the 7th, and part of the 8th vertebræ were removed. The cord did not pulsate. A spoon was introduced between the bone and dura mater, and pus welled up on either side of the cord, and on thrusting a probe between the 6th and 7th dorsal vertebræ much more pus welled up and some pieces of carious bone came away. A channel was then scraped between the two vertebræ, and an abscess cavity on the front of the spine was detected. This was thoroughly syringed out, and much pus flowed away. The cord commenced pulsating when the pus was let out. Drainage tubes were put in, the edges of the wound were brought together, and it was dressed with cyanide gauze.

January 23.—The patient, who has never thoroughly rallied from the operation, gradually sank and died at 10 p.m.

January 24. Autopsy.—In the chest on each side of the vertebræ was an abscess cavity; on the right side it was in contact with the 6th, 7th and 8th vertebræ, on the left with the 7th and 8th. These abscess cavities extended laterally from the vertebræ for about two inches under the pleura. The 5th to the 8th vertebræ were removed for examination. The body of the 7th vertebra was almost completely destroyed, the only living part of it being a small fragment attached to the 8th vertebra. The posterior third of the intervertebral disc between the 7th and 8th vertebræ was destroyed. The disc between the 7th and 8th was intact. There was no pus within the dura mater. The posterior

part of the cord appeared quite normal. On the lateral aspects of the cord there was some thickened inflammatory material which extended to the posterior margins of the posterior roots, but, as just mentioned, left the posterior part of the cord free. Anteriorly it had extended over the cord, but to a less extent than laterally. Opposite the 7th vertebra the cord was soft and compressed.

There was healed phthisis at the apex of each lung, and there were scars of old gastric ulcers in the stomach.

DESCRIPTION OF FIGURE.

Over the shaded area and over a corresponding area at the back there is:—

- (1) Analgesia. Pain being interpreted as touch.
- (2) Impairment of tactile sensibility: (a) velvet not distinguished from silk; (b) points of compasses far apart called one.
- (3) Impairment of power to tell hot and cold apart.
- (4) No delay in perception of pain, touch or temperature.
- (5) No inability to tell passive position of limbs.
- (6) No inability to tell added weights.