Clinical Lecture

ON A

CASE OF HAMMERMAN'S CRAMP.

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GENTLEMEN,—The case which I wish to bring to your notice to-day is one belonging to the class of "professional ailments" in which the constant repetition of the same movement begets an inability to perform that movement—a movement which often constitutes the profession of the sufferer, and is his sole source of income. These troubles are very serious for the patient, and, once established, they prove a source of mental anxiety and worry which can hardly be exceeded. On this account they are deserving of a very careful study, albeit that we know nothing for certain of their pathology, because these troubles are never fatal. The commonest of this class of diseases is "writer's cramp," of which I have seen about two hundred cases. Failure of professional movements other than writing is infinitely rare, but I have had occasion to see pianists who cannot play the piano; violinists who have lost the power to manipulate the strings with the left hand, or hold the bow in the right hand; a violoncello player who had lost the power to "make the nut" with the phalangeal joint of the left thumb; a compositor who could no longer hold the "stick" in his left hand; a tailor who could not sew; a pickle-jar-tyer who had lost the power of grasping the top of the jar with his left hand; a watchmaker who could not hold his watchmaker's lens in his eye; a packing-case-maker who could not use his saw; a bricklayer who could not use the trowel; and lastly a nailmaker (our patient of to-day) who cannot wield his hammer.

Other observers have described similar affections in telegraphists (I have never seen a case of telegraphist's cramp), ballet dancers who perform the "pas des pointes" on the tips of their toes, milkers, and fencing masters; and Professor Dieulafoy once told me that he had seen a cellarman from Rheims who had lost the power of giving a slight rotary movement to a champagne bottle, a movement which he was called upon to exercise all day and every day.

The investigation of these cases requires great care. Search must be made methodically and diligently for peripheral evidence of mischief, and we must bear in mind that no two cases are alike in all respects, and that since no two persons probably perform the same professional act in precisely the same way, so the mode of break-down will be found to differ immensely.

Careful examination of these cases has shown me that the break-down is generally most evident in those muscles which are subjected to prolonged strain rather than in those in which the periods of contraction and relaxation are more equally divided. Thus in writer's cramp it is the muscles of pen-prehension rather than those of pen-movement which are liable to fail. In the comparatively few cases of pianist's cramp which I have seen the extensors of the wrist and the near phalanges have been at fault. In the packing-case maker who could not wield his saw the chief trouble seemed to be in the supra-spinatus muscle, which during the act of sawing is subjected to prolonged strain. "Dancer's cramps" would probably be unknown if rhythmical movements, such as constitute dancing proper, alone were executed. It occurs only in those who abandon the rhythm which is the very essence of dancing for the performance of an acrobatic "tour de force."

The following history of our patient is summarised from that very excellent record which has been made by Mr. L. Barnett, house-physician.

J. M.—, aged twenty-five, nailmaker, admitted Feb. 2nd, 1886. He is a piece worker—i.e., the more nails he can make the more money he will earn. He has worked from 7 A.M. to 7 P.M., with about forty minutes interval for meals. He has worked in a hot place in-doors, and has been in the habit of taking three or four pints of beer per diem with occasional spirits. There is nothing in the family history of definite import; but the death of his

parents at fifty-four and fifty, and the loss of eleven brothers and sisters (out of thirteen) in infancy, make it probable that our patient's "constitution" is not very robust. His work consists in forging nails with a moderately light hammer. The iron is seized with pincers in the left hand, placed in position, and then forged into shape by a rapid succession of blows dealt by the hammer in the right hand. The onset of his trouble was almost sudden. He states that on Monday, June 8th, 1885, after he had been at work for about two hours, he was seized with an inability to direct the blows with his right hand. The trouble increased during the ensuing three hours, when, in consequence of the intense feeling of fatigue, he was obliged to "knock off work" for the day. On June 9th he managed by dint of holding the elbow close to the side to get through his day's work. On June 10th, 11th, 12th, and 13th he worked as well as ever. On the following Monday (June 15th) his trouble returned, but not to the same extent, and he got through his week's work fairly well by holding his elbow close to the side. After this the feeling of loss of aim in the arm recurred every Monday, and gradually wore off during the week, but the period it took to wear off got greater each time. By September the constant pressure of the elbow against the side produced soreness, and when attempts were made to keep the arm against the side the limb jerked, so that further work became impossible, and on Sept. 4th he had to leave it off. The patient states that after this everything he did with his right arm was done clumsily. He was then admitted into the Royal Free Hospital under Dr. Harrington Sainsbury, by whose kindness I first was enabled to see him.

Leaving the Royal Free Hospital, he next went to St. Bartholomew's, and from the latter institution he came here. On admission the "present state" was taken with great care and minuteness by Mr. Barnett. On the chest are a few small scars, the result of burns from sparks; otherwise the skin is normal. The circulatory, respiratory, digestive, and genito-urinary systems present no abnormalities of any kind. The temperature during his stay in hospital was always normal, but the pulse, when recorded, was found to be rather infrequent, being 62 on one occasion and 56 on another.

As regards the nervous system, it is noted that the intelligence was good, that there was no headache, and that the special senses were normal. The third, fourth, fifth, and sixth cranial nerves were apparently normal. The right naso-labial fold was rather less marked than the left; the mouth dropped a little on the right side when at rest and moved a little less vigorously than the left side. The tongue is slightly tremulous when protruded, and the median furrow deviates very slightly to the right side. The right upper limb, if carefully observed, will be noted to be seldom or never quite still. When sitting up with the arms hanging by the side the right arm is the seat of constant slight movements,—elevation, and adduction of the humerus, and flexion of the elbow. When an attempt is made at voluntary movement, the spasmodic action of the muscles of the upper limb is increased. The arm is held fixed to the side, the wrist is extended, the hand supinated and closed. The spasmodic action is seen to extend to the deltoid, trapezius, and pectoral muscles. The right sternomastoid is also slightly affected. When an attempt is made to use the hammer, the spasm reaches its maximum, and affects the right arm and shoulder to an extent which makes analysis impossible. It is evident that some of the muscles attached to the scapula are in an abnormal condition. I have followed my invariable plan and have carefully outlined both scapulae with a blue pencil. By this means we see that the inferior angle of the right scapula is at a higher level than the left, that the distance between the mid-vertebral line and the base of the scapula is 5 in. on the right side and 4½ in. on the left. The spinal border of the right scapula is somewhat tilted, and stands away from the surface of the back. The mass of the rhomboid muscles is very distinctly larger on the right side than the left. Looking to the lower axillary region, it is evident that the mass of the serratus magnus muscle is distinctly less evident on the right side than on the left. There is nothing wrong with the lower limbs, except that the plantar reflex is more marked on the right side than the left. Sensation is everywhere normal. The muscles were tested electrically. When I first saw this patient at the Royal Free Hospital, with Dr. Sainsbury, the irritability of the right serratus magnus to both forms of

current was distinctly diminished. Now, however, the difference in irritability of the two serrati is scarcely noticeable. The patient is free from pain. After attempts at voluntary use of the arm there is a sense of fatigue and some aching, especially beneath the prominent rhomboid muscles on the right side, but beyond this his condition causes no suffering. *None of the nerve-trunks are in the least tender.* It is very evident that the spasm is not now special to the performance of his professional act of hammering. When he is asked to write he picks up the pen with his left hand and then transfers it to the right, and his attempt to sign his name is interrupted by repeated slight shocks of spasm, and the resulting signature bears evidence of the jerking of the hand. No treatment has been of any service to him. He has previously been in two hospitals without benefit. In this hospital he has had electrical treatment, and in addition he took one-sixteenth of a grain of extract of physostigma from Feb. 6th to the 15th, and twenty minims of paraldehyde three times daily from Feb. 15th to the 21st. He is no better.

There are some points about this patient to which I desire to direct your attention, because they seem to me to place his case in a category different from some of the other professional ailments to which I have alluded. First, as to the mode of onset; it is to be noticed that it was comparatively sudden, and the patient fixes the date absolutely, and he states that before June 8th, 1885, he had no trouble at all, but since then he has never worked satisfactorily. In most other "professional ailments" the onset is gradual, the loss of function increases by scarcely perceptible degrees, and for a patient to be able to fix the exact day of onset is infinitely rare. I took occasion to tell you in my preliminary remarks that these professional ailments most commonly affect movements which necessitate, as in writing, a prolonged contraction of muscles. Now, in hammering it is difficult to say where (if anywhere) this prolonged contraction occurs. It would be most likely to occur in some of the muscles which steady the shoulder, and the permanent slight displacement of the right scapula in the case we are considering rather favours such an idea, but I am unable to say anything more definite.

The act of hammering is probably less automatic than many other acts of a similar kind. The action of the right hand depends to a certain extent upon that of the left, which places the metal in position for being struck. The action of the left hand in selecting and placing in position the nails to be forged is far from being a mere monotonous repetition of the same act, and hence the position of the nail when receiving the blows from the hammer must be to some extent uncertain. Hence it follows that each blow with the hammer involves the taking aim and the exercise of no inconsiderable amount of judgment. The act is as much mental as it is automatic, and both arms and the eyes have to act in harmony for its accomplishment. It seems to me such an act as would be likely to produce a considerable amount of mental worry, which would be redoubled on the first appearance of any failure of accuracy. The repetitions of the act were very numerous, and during the eleven hours of work very many thousand blows with the hammer must have been delivered. Dr. Frank Smith of Sheffield, who published a very able paper on this subject in the *British Medical Journal* of October 31st, 1874, estimated that a pen-blade forger who suffered similarly to our patient delivered about 28,000 blows per diem, and if we assume that the hammer weighs 3 lb. and is lifted 1 foot for the delivery of each blow, this amounts to 35 foot tons per diem. If we assume that the work of delivering the blow is equal to that of raising the hammer, and if we add to the weight of the hammer the weight of the arm, we must allow that the work done is about 150 foot tons per diem. This is by no means a very excessive day's work.

You will observe that, as I have previously said, the trouble is by no means limited to the act of hammering. It very obviously interferes with the accuracy of all voluntary efforts of the right hand, and, indeed, the spasm is noticeable to some extent when the patient is making no voluntary effort with it. It is, or used to be, stated in text books that in these cases, beyond the professional trouble, there is nothing detectably wrong, and that all movements excepting the professional movement are perfect. I dissent from both these statements; but, nevertheless, the present case differs from the great majority of professional troubles in the very large amount of peripheral evidence of mischief which is present and the rapidity with which the motor

trouble has spread, as it were, from the professional act to the involvement of other acts. Indeed, one cannot escape from the belief that the motor trouble is part of a hemiplegia, for added to the disorderly movements of the upper limb, we have evidence of slight failure of the right side of the face and the right half of the tongue, and probably the exaggerated plantar reflex on the right side tells of diminished cerebral control over the right leg. These trifling signs of hemiplegia, added to the fact of comparatively sudden onset, make it highly probable that the lesion, whatever it may be, would be found in the motor area of the cerebral cortex on the left side. In addition, notwithstanding that I can find no defect of intelligence of any definite kind, I confess that there is something vacuous in the expression of his face, which, added to a certain listlessness of manner and utterance, leaves upon me the impression that mentally he is below the average. He further admits that since his trouble he is more easily moved to anger than formerly was the case.

There is now loss of control over a large group of muscles, and the history of the case makes it probable that at the beginning of his trouble the area of diminished control was smaller than at present, and possibly was limited to one or two muscles, or perhaps a single muscle. That the serratus magnus was the first, or one of the first, muscles to be affected seems to me very likely. It certainly is smaller than its fellow; it certainly was at first less irritable to both forms of the electric current than its fellow; it was the only muscle that I could definitely say was not in a healthy condition; it certainly is brought into play whenever the arm is raised in the act of hammering, and most certainly the plan adopted by the patient of holding the elbow close to his side in the act of hammering would enable him to do so without scapular movement, and thus save the muscle over which control had been lost. Again, the slightly faulty position of the right scapula points to some weakness of the serratus magnus. The slight tilting backwards of the vertebral border and the slight elevations of the lower angle are both indications that the serratus is weak, and the large size of the rhomboid muscles on the right side looks as if they had been employed to compensate for the weakness of the serratus and had been used for steadying the scapula. The prominence of the rhomboid muscles, even when the scapula is at rest, coupled with the fact that the vertebral border of the right scapula is $\frac{1}{4}$ in. further from the middle line than its fellow, led me to think that possibly a bursa or abscess had formed beneath the muscles, and at my request Mr. Godlee very kindly inserted an aspirator at the spot where the prominence is most marked, but with no result.

This case is of interest because of its rarity. It is the first of its kind that I have seen, and for me its chief interest lies in the fact that in many points it offers a striking contrast to all the other cases of professional ailments (and they are not few) which I have seen. In every case of professional trouble that I have seen I have been able, as in this one, to detect peripheral evidence of mischief, but this one is exceptional in the fact that the *peripheral* evidence is evidence of *cerebral* mischief, and enables us to conclude that the lesion is in the brain. This is the only case of hammerman's cramp that has come under my notice, and the only record of similar cases which I can find is in the short paper by Dr. Frank Smith previously alluded to. He was physician to the Sheffield Infirmary, and had seen, naturally, a very large number of hammermen among the patients of the infirmary, and he has placed upon record eight cases analogous to the one we are discussing, and which he called cases of "hephestic hemiplegia or hammer palsy," the word "hephestic," it is perhaps necessary to state, being derived from the Greek word *Ηφαίστος*, Vulcan. Of these eight cases six were distinctly hemiplegic in character, while two were cases of brachial monoplegia. In one there was spasm with wasting of the forearm. In one other case there was spasm. In the other cases the symptoms were paralytic, and in four of the cases there was derangement of tactile sense. The ages of Dr. Frank Smith's patients were thirty-one, forty, thirty-two, eighteen, twenty-four, thirty-five, twenty-nine, and fifty-five. He alludes to the points of similarity between these cases and those of writer's cramp, but says that the disease positively differs from writer's cramp in the fact that the cerebral centres are implicated.

It is the difference from rather than the similarity to cases of writer's cramp which constitutes the interest of the case. Cerebral symptoms in writer's cramp and allied professional ailments are infinitely rare, and when present are

very vague and consist at most of some slight dizziness during attempts to exercise the deranged function. In the case we are considering and in Dr. Frank Smith's case cerebral symptoms have been prominent, and, once established, persistent, and in no sense intermittent. Why should this be?

I would offer the following explanation:—Muscular acts differ enormously in the amount of cerebral effort they demand. In some muscular acts we are unconscious of any cerebral effort. This is notably the case in walking, which appears to be almost a purely reflex act, and is often accomplished unconsciously. The woman who walks about gossiping and knitting will do an extraordinary amount of work without apparently giving a thought to her knitting-needles. Even writing—i.e., quill-driving and copying—may be done almost automatically, and so, indeed, may any act in which the tactile sense is largely employed to guide the limb in its movement. An incident which once occurred to myself will serve to show how very automatic a delicate act may become. Some years ago I got a small flake of iron rust into my eye while railway travelling. This caused slight annoyance at the time, but in a day or so I began to suffer from catarrh of the eye, which was excessively painful at times, causing a spasmodic flood of tears and the forcible closing of both eyes. It was in the days when I used a razor, and one morning I was shaving my chin before a looking-glass when suddenly the eyes filled with tears and I closed them; but, nevertheless, I unconsciously finished my shaving, and shaved my chin quite smooth with my eyes shut. There must have been very little cerebration in this act; in fact, had I appreciated what I was doing, I should inevitably have cut myself. My shaving on this morning must have been almost a pure reflex, brought about by constant daily repetition of the same act.

Other acts, again, can never become automatic, and this is notably the case when the movement of the limb is not guided by tactile sense in the performance of the special act. When, for example, did anyone ever thread a needle automatically or unconsciously? During such an act as this there is evidence of strong cerebral effort, as is shown in the face of the sempstress. The taking aim—whether it be at a needle's eye, a bull's eye, or the bit of iron to be forged into a nail—involves the bending of the mind towards the object aimed at; and the aiming at an object against time, as occurs to the piecemaker forging nails, is an act, one would think, which is calculated to cause brain-fag rather than muscle-fag. And the limited number of clinical facts at our disposal seem to point to the correctness of this assumption. When the work done by the muscle is great, and the cerebral effort involved is small, we may well expect the muscle, rather than the brain, to show signs of failure. When, however, the cerebral effort is out of proportion to the mechanical work, as in the repeated act of aiming with a hammer, it is not surprising that, if breakdown occurs, it should occur in the brain. It might be urged that this is not a "professional" trouble—that it is merely a hemiplegic attack followed by post-hemiplegic spasm occurring accidentally in a nail forger. Against this supposition we have to put the fact that his first sign of trouble was in connexion with the professional act; that the spasm of the arm is only seen at its maximum when he attempts to perform the professional act; and that the case does not stand alone, two of Dr. Frank Smith's cases having been very similar in character.

In the average case of writer's cramp I have always contended that, although peripheral evidence of mischief is always present, the evidence does not enable us to say that the lesion is central, although, of course, I very well know that brain cell, nerve fibre, and muscle are practically one. Ordinarily professional ailments never spread to other functions, and certainly the man with writer's cramp is not more likely to become hemiplegic than anyone else. In the case we are considering the trouble, from being merely professional to begin with, quickly spread. This in itself is evidence that in one case the lesion is peripheral and in the other case central, for at the centre where the nerve fibres converge almost to a point any sudden lesion is not likely to be limited to the cells connected with one small function only. The nervous system may be compared to a railway with branch lines and a "central" terminus. Now, a fire at Holyhead would not cause any disturbance at Carlisle, notwithstanding that they are both stations on one system of railway, but a fire at Euston would certainly derange the functions of both these outlying stations, and of many others.

The lesion in our case probably began in the part of the centre corresponding to the serratus magnus muscle (for as each limb has its controlling "centre" in the brain, so, we must assume, has each muscle of each limb), and thence quickly spread until the right upper limb, the right side of the face, the right half of the tongue and the right leg (?) became involved.

Seeing that the leg is very slightly and doubtfully involved, the lesion, whatever it may be, is apparently almost limited to the left ascending frontal convolution, to an area to which the blood is brought by the ascending frontal branch of the Sylvian artery. Seeing that the onset of the trouble was comparatively sudden, it is not probable that the change which has taken place in the brain is of the nature of a slow degeneration or sclerosis. It is to the vessels of the part to which we must look for an explanation, to hæmorrhage in the area of the ascending frontal artery or embolism or thrombosis of it. There are manifest difficulties in accepting the theory of hæmorrhage or embolism, and against the latter supposition is the absence of any source of emboli. On the whole, I adhere to the belief that the physical basis of our patient's trouble will be found in thrombosis of the ascending frontal branch of the Sylvian artery. In favour of this theory is the fact that his trouble at its commencement was always worse on Monday morning, when the overworked area of his brain had had a period of rest, and when the circulation through it had been, presumably, slow. If we imagine a clot forming in one of the smallest branches and gradually spreading backwards, so as to involve the larger branches of the ascending frontal branch of the Sylvian branch of the middle cerebral artery, we have conditions which, automatically and pathologically, would account for the clinical facts. Thrombosis on the side of the veins leading from this area might conceivably lead to a similar condition, and cause such derangement of nutrition as to prevent the proper control of movement and lead to such a state of things as we are confronted with.

The prognosis in this case is, I fear, not good. Between September, 1885, and February, 1886, his progress has been *nil*, in spite of complete rest, good nourishment, and the therapeutic skill in at least three of our metropolitan hospitals. The deficient irritability of the serratus magnus has disappeared, but even this has not caused more benefit than a similar recovery of normal irritability causes in ordinary hemiplegia. With the exception of this diminished irritability, there have been no indications for treatment in the affected limb. No tender nerves have seemed to demand a blister (which is often of very great use in cases of professional trouble), and no massage or shampooing of the limb would be likely to influence the brain. Rest, if anything, should lead to recovery or improvement; but six months' rest has done nothing, and I very much fear that his trouble is likely to be permanent, and that his loss of control over the affected group of muscles will continue.

Address

ON

MICROBES AND DISEASE,

INTRODUCTORY TO THE DEMONSTRATIONS IN BACTERIOLOGY,

Delivered before the British Medical Association at Brighton, August, 1886,

By EDGAR M. CROOKSHANK, M.B.

GENTLEMEN,—Many, perhaps, may have expected that the formation of this bacteriological laboratory would be made the occasion for reading papers or holding discussions in connexion with bacterial pathology; it might have been regarded as an opportunity for publishing the discovery of some interesting micro-organism, or for giving an account of recent researches in connexion with the etiology of some morbid process which has been hitherto veiled in obscurity. This, however, is not the case, and for this reason. As is only too well known, we have in England no laboratory devoted to this particular line of research; we have, so far