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Dr W Hendrich

with the writer's compliments

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Bilateral Deviations of the Eyes. By PRIESTLEY SMITH, M.R.C.S.,
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THE action of each one of the six muscles which move the eye, has been ascertained with great precision; the symptoms produced by paralysis of the motor nerves of these muscles are accurately known, and it is possible in every case of such paralysis, however slight may be the deviation of the corresponding eye, to determine which is the nerve affected. Many investigators have contributed to the present state of knowledge on this subject, but it is to von Graefe that we chiefly owe the ingenious and accurate methods of studying the causes of double vision, by means of the relative positions of the true and false images, and by the application of prisms. English readers are indebted to Dr. Soelberg Wells, for a complete exposition of the whole subject in the Royal London Ophthalmic Hospital Reports, Vol. II.

Notwithstanding the precision of these means of diagnosis, cases of deviation of the eyes occur, which cannot, by any ingenuity, be referred to lesion of any individual motor nerve or nerves. Two such cases I have to record. The impairment of movement in each case was due, I believe, to lesion of the brain-centre which normally presides over the movement in question,—a cause of ocular deviations which has hitherto received very little attention from ophthalmic surgeons.

In investigating cases of this kind, it is necessary to remember not only the action of each muscle upon the eye, but also the various ways in which movements of one eye are associated with movements of the other. This association of symmetrical voluntary movements on the two sides of the body is probably more complete, and more beyond our control, in the case of the eyes than in any other instance. For example, the muscles of the mouth, though usually acting bilaterally, can, with attention, be brought into independent action; most persons can acquire the habit of closing one eye to some extent while keeping the other open; but no person with healthy eyes can follow the movement of an object with one eye, and keep the other eye motionless. The advantage of this close association is obvious. Perfect vision occurs only when both optic axes are accurately directed towards the object looked at, the slightest deviation of either produces double vision, and hence the power of moving the eyes independently of each other, did we possess it, could bring us nothing but confusion.

The clinical studies of Dr. Hughlings Jackson, and the experiments of Dr. Ferrier, and others, have shown that this association of bilateral movements depends, in each case respectively, upon the existence of a brain-centre, which, when excited, issues an impulse to each side of the body simultaneously. For example, Dr. Ferrier has found in the convolutions of the frontal region, a brain-centre which, when excited, causes both eyes to turn away from the side excited. If this centre be paralysed instead of excited, then the corresponding centre in the other half of the brain, acting unopposed, turns both eyes towards the side of the lesion. (See cases by Dr. Hughlings Jackson in the *Ophthalmic Hospital Reports*, Vol. viii, Part I.) This centre associates the internal rectus of the one eye with the external rectus of the other. Under its guidance we are enabled to follow the horizontal flight of a bird through the air, and to traverse the lines of the book we read.

Again, Dr. Jackson and Dr. Ferrier agree in stating that there is in the cerebellum a centre which governs converging movements of the eyes. The association in this case is more complex than in the case of lateral movements, for it appears that vertical movements are also involved in the association, viz. : upwards with diminished convergence, downwards with increased convergence, a combination obviously in accordance with the general requirements of vision at different distances. (See note to Dr. Jackson's paper already referred to.) It will, however, be sufficient here to speak only of the horizontal movements of convergence. The centre in question associates the internal rectus of one eye with the same muscle of the other. Under its guidance we are able to look successively at an object on the horizon, and at a pin's point a few inches from the face.

Supposing now, that we had before us a patient in whom the left centre for lateral movements had been destroyed by disease, we should find that he had lost the power of turning his eyes towards his right side, and that both eyes deviated towards his left, in consequence of unopposed action of the corresponding right centre. And, supposing further, that the centre for convergent movements remained intact, we should find that he still retained the power of looking from a distant to a near object, and that in doing so, the internal rectus muscle, which a moment before appeared to be paralysed, acted in a normal manner. We should find, in short, alternate conditions of paralysis and activity in one and the same muscle.

In investigating such a case, would it be possible to refer the symptoms to lesion of one or more of the motor nerves? At first glance the lateral deviation of the eyes might be ascribed to paralysis of the sixth nerve on the one side and of the third on the other, but such a diagnosis could not be maintained. In the first place, in every case in which the two eyes are symmetrically affected, whether as to

vertical, lateral, or convergent movements, we should have to suppose two lesions at a distance from each other affecting, simultaneously and equally, the two particular nerves, or parts of nerves (*e.g.*, the branch of the third to the internal rectus), which supply the muscles concerned. Such a supposition is highly improbable even in cases of a paralytic nature, whilst in cases of spasm, it is quite untenable. In the second place, when, as in the above supposed case, one particular muscle, which in health has to do duty in two forms of bilateral movement, is found to be competent for the one, but incompetent for the other, the diagnosis of nerve lesion is obviously impossible. In the presence of this latter symptom it would probably be safe, in every case, to diagnose lesion of the brain-centre which presides normally over the impaired movement, but even in those cases in which this symptom does not occur, provided the impairment of movement is strictly symmetrical on the two sides (*e.g.*, loss of vertical movement above the horizontal line), the same diagnosis would probably be correct.

It is entirely beyond the scope of this paper to attempt any full discussion of the complex ways in which ocular movements are associated with each other, and with movements of other parts of the body, or to speak of the exact localities of the corresponding brain-centres. This subject is engaging the attention of the most skilful investigators, and will doubtless be elaborated with precision before long. I am indebted to the writings and references of Dr. Hughlings Jackson for what I have been able to learn of the subject.

My object is simply to draw attention to a class of ocular symptoms to which the text books make no reference, and of which the following cases afford clinical illustrations.

Case 1.—*Lateral movements impaired: convergent movements natural.* (A full record of this case appears in the Ophthalmic Hospital Reports, Vol. viii., Part 2: the essential features only will be repeated here).

George M., æt. 17, a well-grown, intelligent, healthy-looking lad, by trade a milkman, came to the Eye Department of the Hospital on April 27th, 1875.

He stated that, about a week before, he had had "a bad bilious attack," viz., violent vomiting and retching, continuing for several days, accompanied by great pain in the head, giddiness, and, after the vomiting had lasted three days, "something wrong with eyes." He now felt well again with the exception of some pain in the left temporal and frontal regions, and an affection of the eyes.

Each eye was examined as regards acuity of vision, refraction, accommodation, and appearance of fundus. Nothing of pathological significance existed in either.

Both eyes were fixedly turned towards the patient's right. The

deviation, measured by prisms, equalled 20° in each when looking at distance. The head was kept turned towards the left to counteract the position of the eyes. An object was moved from right to left, and from left to right in front of the patient. Neither eye could follow it to the smallest extent towards the left, but both, on the contrary, were capable of a very slight additional turning towards the right. This they performed, however, in a jerking manner, and at once returned to their former position. An object was now held at ten feet distance and rather towards the patient's right, so that his eyes could be fixed on it, and it was then made to approach his face. Both eyes steadily converged so as to remain fixed on the object until it was only five inches from the face. This involved a remarkable phenomenon, viz., the right eye which had before refused to move towards the left, now made a considerable excursion (about 15°) in that direction.

Further attempts to induce movements, by lateral movement of an object, gave precisely the same results as before. Upward and downward movements were performed normally by both eyes. A peculiarity existed in the action of the eyelids. There was frequent winking of the right lids, accompanied by a similar, though incomplete, winking of the left. The lids were rather more widely open on the left side than on the right. The skin of the right half of the forehead was in horizontal wrinkles.

Ten grains of iodide of potassium were given thrice daily. Fourteen days later the pain was almost gone; power of movement towards the left was beginning to reappear in each eye, though more in the right than in the left; in both, the movements were of a jerking character, the oscillations being performed around the vertical axes of the eyes, and therefore attributable to the lateral muscles.

Improvement has continued steadily up to the present time,—five months since the first visit.

The right eye has completely recovered freedom and steadiness of movement both to the right and to the left. The left eye has recovered less completely. To the right it moves freely and to the natural extent, and in harmony with its fellow, so that an object to the patient's right is seen single; to the left it cannot yet move to the normal extent; when both eyes are turned towards the left, this eye turns insufficiently, so that parallelism is lost and double vision occurs. The horizontal folds before observed in the right forehead have disappeared, and winking occurs only to the natural extent and equally on the two sides. As regards acuity of vision, ophthalmoscopic appearances, &c., no change has occurred.

The seat of the pain in the preceding case agrees with the locality in which Dr. Ferrier has found the centre for lateral turning of the

eyes; but, inasmuch as the pain was in the *left* forehead, and the eyes turned to the *right*, the lesion if coinciding with the pain, must have been such as to cause tonic spasm rather than paralysis. On this supposition the interference with further movement towards the right becomes intelligible. Moreover, this case presents a remarkable resemblance to a case of hemi-spasm, recorded by Dr. Hughlings Jackson (*loc. cit.*, page 99), viz.: in the unsymmetrical action of the lids, and the unilateral wrinkling of the forehead. At the time of taking the notes I was ignorant of this resemblance. I am unable to form any hypothesis as to why the recovery of movement was not symmetrical in the two eyes.*

Case 2.—*Convergent and vertical movements impaired—lateral movements natural.*

John G., æt. 44, a groom, was admitted into the Hospital early in June of this year, under the care of Dr. Heslop. By Dr. Heslop's permission, I record the result of an examination of the eyes which I then made at his request.

The acuity of vision, refraction, and ophthalmoscopic appearances were normal in both eyes. The patient's appearance was singular by reason of an unnatural position of the eyes. They maintained a constant convergence towards a point two feet distant from the face, and rather below the horizontal plane. A flame held at this distance was seen single, but at any greater distance it was seen double. The patient was unable to *diminish* to the smallest extent the convergence, so as to direct the eyes to a point more distant than two feet. When the flame was brought nearer to the face, in the horizontal plane, it appeared that there was very slight, if any, power of *increasing* the convergence. In short, *under this test*, it appeared that both the external recti, and both the internal recti were paralysed. By lowering the flame while it approached, however, it was found that, in looking downwards, the eyes retained some power of increasing their convergence, but to what extent was not ascertained, as the movement appeared to be performed unsteadily. Vertical movement upwards, above the horizontal plane, was totally lost. The strongest effort to look higher than this resulted only in slight vertical jerking movements in both eyes, and a little elevation, without jerking, of the upper

* Since sending the above to press, I have had the opportunity of examining, with Dr. Sawyer, a patient under his charge, whose ocular symptoms at the present time correspond exactly with those of ordinary paralysis of the left sixth nerve. The patient, however, states very positively that the affection originally involved both eyes. There was, he says, pain in the right forehead and temple, both eyes were turned fixedly towards the right, and it is only recently that the right eye has recovered its mobility.

If this history be correct, this case affords another instance of unsymmetrical recovery after bilateral deviation. The position of the pain in this case would indicate paralysis rather than spasm.

lids, so as to uncover a little of the sclerotics above the corneæ. With regard to associated lateral movements, the eyes were examined by moving an object from right to left and from left to right, at a few feet distance. Both eyes followed the object to the normal extent in either direction, though when turned to the maximum there was a little jerking of the eye turned inwards. They preserved throughout the degree of convergence before stated. *Under this test*, both internal and external recti were active.

At the time of the examination, this patient had no pain in any part of the head. He complained of giddiness, and his gait was uncertain. When examined a fortnight later the conditions were unchanged.

This case forms a counterpart to the preceding one. The particular movements which were impaired in that, were intact in this, and vice versâ. It illustrates, in a most striking manner, Dr. Jackson's supposition before referred to, that there are associations between vertical and convergent movements, viz., downwards with convergence, upwards with divergence (or, as I should venture differently to express it, downwards with increased convergence, upwards with diminished convergence, for divergence, strictly speaking, never occurs in normal vision), and, furthermore, that there is an association between these movements and those of locomotion.

This man had lost the complex movement *upwards with diminished convergence*, and his *gait was uncertain*.





