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WITH REMARKS ON

THE ACTION OF LIGHT ON THE PUPIL.

BY

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FOUR CASES OF SPINAL MYOSIS.

GEORGE SMITH, æt. 51, tailor, applied to me for advice on account of dimness of sight. He stated that he enjoyed good health until July last year, when one very hot forenoon, while crossing the North Bridge, he felt giddy and faint, but managed with some difficulty to walk home. The following day he experienced pain in his back, extending to his legs, increased while taking exercise. His back was also tender on pressure. He had, moreover, twitchings, and occasional numbness in his legs, especially the right, with want of power, so that in walking he staggered, and had to use a stick. He could not stand steadily in the dark, but had to grasp at some object for support. He at this time complained of dull pains in his forehead, and noticed that his water constantly dribbled away. These symptoms prevented him continuing more than a few hours daily at work. He did not observe his sight affected till the end of December, when he discovered that the sight in his right eye was dim. Since then the sight has neither improved nor deteriorated, while with his left eye he sees as well as he ever did, but he has noticed that objects appear darker than they used to do, and that he requires more light while working than formerly sufficed. He is not conscious that his face flushes more readily than natural.

On examination, I found that while walking his gait was unsteady, and that he could not plant his feet firmly on the ground. He also exhibited considerable awkwardness in turning. He stood erect with his eyes closed, but swayed a little from side to side. On looking at the eyes, the drooping of the lids and the small size of the pupils at once attracted attention. The drooping of the lids was more marked in the left than the right eye—the left palpebral aperture at the widest point measuring only $3\frac{3}{4}$ lines, while the right measured 4 lines. Each pupil measured $\frac{3}{4}$ line in diameter; they were insensible to the influence of light, but contracted to $\frac{1}{2}$ line during the act of accommodation for a near object. Under repeated instillations of a strong solution of sulphate of atropine, the right pupil became dilated to a little beyond medium size, so that it measured $2\frac{3}{4}$ lines in diameter, and was quite immobile.

With the right eye the patient was slightly myopic, but even with a suitable glass had difficulty in making out very large print (No. LXX. of Snellen) at 20 feet distance. With the left eye vision was normal (No. XX. at 20 feet).

With the ophthalmoscope a slight degree of atrophy, with shallow cupping, of the right optic nerve was discovered. From the very small size of the pupil, the interior of the left eye could not be examined. Under the use of iron, combined with small doses of strychnia, a considerable improvement occurred in most of the patient's symptoms, but the pupils remained contracted, and the sight in the right eye unaltered.

For notes of the history and general symptoms of the following case, and for bringing the patient under my notice, I am indebted to my friend Dr Sanders.

John Grey, æt. 35, a clerk, was admitted to the Royal Infirmary on the 11th of June 1869, complaining of weakness in his legs and right arm.

He always enjoyed good health until fifteen years ago, when he contracted syphilis. He has never had any eruption, nor sore throat, but suffered from a swelling over his right ulna, probably of periostitic nature, which disappeared under the use of iodide of potassium. He resided for a year in India, and shortly after his return, nine years ago, he had an attack of hemiplegia, which affected the left side of the face and right side of the body. Twelve months afterwards, when nearly convalescent, he consulted Dr Christison for convergent squint of his left eye, and was ordered some mercurial pills, and, while taking them, he states that he caught cold, to which he refers the commencement of his present disease.

The patient is a man of middle height, somewhat emaciated; has large joints and florid cheeks. There is very marked contraction of pupils. They each measure half a line in diameter, are insensible to light, but contract during the act of accommodation for near objects. There is no drooping of the eyelids. The skin is cool, soft, and moist. The temperature of the inferior extremities, more especially the right leg, is below that of the body. There is diminution in the motor power of both legs, accompanied by a feeling of stiffness. He can move them in all directions, but not actively. He can stand pretty steadily, even when the eyes are closed; but when he does so, he bends his body forwards, while his legs are curved slightly backwards at the knee-joints. He walks with a peculiar straddling gait. The muscles of his right calf and thigh are smaller than those of his left. There is no atrophy of the deltoid. There is partial anæsthesia, without analgesia in the right iliac and inguinal regions, extending down the right leg. Reflex action is very marked in right leg—so much so, that it often starts up without any apparent stimulus. Motor power in the right arm and hand is diminished, so as to prevent the patient

carrying on his occupation as clerk. He does not complain of headache, but considers his memory affected.

The patient's vision is very slightly affected. With either eye he is able to read fine print, and is able to distinguish colours perfectly. To permit of ophthalmoscopic examination, and to test the extent to which the pupil will dilate, a drop of a strong solution of atropine was introduced into the left eye. The following day the left pupil measured 2 lines in diameter. With the ophthalmoscope a slight degree of "cupping" and lighter colour of the optic disc, indicating a little atrophy of nerve substance, was the only pathological condition discovered.

Dr G. W. Balfour directed my attention to the following two cases, and kindly supplied me with notes of their history and the results of examination into their general, and more especially their nervous, symptoms :—

John Dann, æt. 43, iron-turner, was admitted to the Royal Infirmary May 12, 1869, complaining of a staggering and inability to walk, a difficulty in making water, and dimness of sight after reading for a time.

About six years ago he was seized with pain in his bladder, which was so severe as to compel him to leave his work. This pain returned at intervals of a month or two, after which he noticed that he could not make his water freely, and eventually that it dribbled away at night. He applied to a local practitioner for relief, and was treated for paralysis of the bladder, and subsequently for stricture. He was next treated at the Newcastle Infirmary for stricture and diseased prostate, and after two months was discharged as cured. He soon thereafter felt that he staggered, and could not walk straight in the streets, and observed, while washing his face, that, on shutting his eyes, he could not help falling forwards on to the basin. He once more applied for advice at the Newcastle Infirmary, and was again treated for enlarged prostate; but obtaining no benefit from the treatment pursued, he was sent to the Edinburgh Royal Infirmary to the care of Dr Watson, because of supposed prostatic disease. Finding it to be a case of nervous affection, Dr Watson transferred the patient to the Medical House. The patient has for five years past had severe pains in the rectum, to allay which he used to employ laudanum injections, but has desisted from their use since January last.

Dr Balfour found, on careful examination, that the skin of the trunk and extremities was insensible to pain, except in a narrow zone extending round the body, its breadth corresponding to the distance between the sixth and twelfth dorsal vertebræ. Sensibility in this zone is not increased. Electro-mobility and electro-sensibility were unimpaired. He complained of the sensation of a tight cord round his waist. He walks somewhat feebly, and staggers on turning. He also sways considerably if he closes his eyes while

standing, and would fall if he did not open his eyes, or grasp some object for support.

On examining his eyes I found the left pupil more contracted than the right; the left measuring ¾ line, the right 1 line in diameter. There is a tendency to divergent strabismus of the left eye, for when the patient looks fixedly at an object about a foot from the eye, the left eye is seen after a time to roll outwards. Vision in the right eye is perfect, but with the left only moderate-sized print can be read. The pupils are insensible to light, while atropine only occasions medium dilatation (to 2 lines). On ophthalmoscopic examination both optic nerves were found considerably injected; while in the left eye there was a peculiar congenital abnormality, a portion of the sheaths of the optic nerve fibres passing beyond the fascia cribrosa, and extending over the retina upwards and outwards from the optic disc for a distance about equal to the diameter of the optic disc. In other respects, the fundus of both eyes is normal.

Under the use of nitrate of silver in ½ gr. doses, the patient considerably improved during his residence in the Infirmary.

The following case is at present in Dr Balfour's wards. Although it is certainly not a typical example, I here include it, because the myosis is well marked, presenting similar features to the contracted pupils in the other cases, and because there are some slight and obscure nervous symptoms which *may* be indicative of incipient spinal affection.

Robert Clerk, æt. 66, a clerk, was admitted into Dr Balfour's wards on 18th October 1869, complaining of general debility. His appearance sufficiently indicates that for a lengthened period he has been in straitened circumstances. He, however, enjoyed good health till three years ago, when he suffered from varicose ulcers on his legs, which, under treatment, disappeared in about six months. Since that time he has never completely regained his strength, although he thinks he has improved of late. For the last two or three years he has been troubled with twitchings and startings of the legs while in bed at night, and for three months he has experienced a great heat in the skin, especially of the legs. He has no incontinence of urine, but states that he cannot expel his water with any force.

On examination no decided impairment of muscular power or of sensation could be anywhere detected. His gait, however, is unsteady, and when he stands with his feet close together and shuts his eyes, his body sways somewhat, but he can stand thus without support for some time.

Both pupils are of the same size, and markedly contracted, measuring barely 1 line in diameter, and only partial dilatation (to 2½ lines) ensues on the application of a strong atropine solution. No alteration in the size of the pupil is observable under the influence of light, but when near objects are looked at contraction at

once ensues. Vision is good, though not perfect in both eyes, and there is no colour-blindness.

On ophthalmoscopic examination a slightly atrophic condition of the optic nerves was observable.

(I may state that in the examination of this patient considerable difficulty was experienced in getting from him an accurate account of his history and symptoms, as he exhibited a great tendency to modify his statements to what he imagined would please his examiner.)

These four cases serve well to illustrate the connexion between certain eye-symptoms and a diseased condition of the spinal cord. In all of them there was marked contraction of the pupil, which differed from myosis due to other causes, in that the pupil was insensible to light, but contracted still further during the act of accommodation for near objects, while strong solutions of atropine only induced a medium dilatation of the pupil.[1] In three of the cases a slight degree of atrophy of the optic nerves existed, as was evinced by a shallow excavation and lighter colour of the optic disc. In one, we observed a symptom which has been noticed occasionally in spinal disease by Brown-Sequard and others—namely, a drooping of the upper lids. In none of the cases was there any appreciable colour-blindness. As regards the nature of the spinal lesion, in one case the characters of locomotor ataxy were well marked; in the other two the form of spinal affection is doubtful; while in the fourth patient, as I have already mentioned, the symptoms of spinal disease are by no means well marked.

To most of the eye-symptoms found in these cases I alluded at length in a previous communication to this Journal.[2] I will therefore pass them over without remark at this time. But I now desire to direct special attention to a very remarkable circumstance which I noticed in the case that formed the subject of my previous paper, and which I again observed in all the above cases, viz., that although the retina is quite sensitive, and the pupil contracts during the act of accommodation for near objects, yet an alteration in the amount of light admitted to the eye does not influence the size of the pupil. This cannot be explained by the supposition that the pupil is already so small as to be incapable of further contraction under light; because (in the healthy eye) a still further degree of contraction of the pupil may be effected by the use of the Calabar bean, and yet the pupil varies in size according to the intensity of the light. The only possible solution of the difficulty is to be found in the theory, that for contraction of the pupil under light it is necessary that the cilio-spinal nerves remain intact, and, as in these

[1] I may mention, that the patients have been frequently carefully examined as to these points with a like result by Mr Walker, Professor Sanders, Dr G. W. Balfour, Dr Barde of Geneva, and many others.

[2] Edin. Med. Journal, February 1869.

cases of myosis the cilio-spinal nerves are paralyzed, light does not influence the pupil. But hitherto this contraction of the pupil under light has been invariably referred to reflex stimulation of the ciliary branches of the third pair, which supply the circular fibres of the iris. If this latter view were correct, I see no reason why in these cases light did not influence the pupil. In all of them the retina was thoroughly sensitive to light, and in all of them the ciliary branches of the third pair were healthy and active (as was shown by the further contraction of the pupil during the act of accommodation, which can only be referred to these nerves). But in all there were symptoms of spinal disease, and in all myosis due to paralysis of the cilio-spinal nerves. I am therefore inclined to the former view, in which case it is necessary to assume that the contraction of the pupil which naturally occurs when light is admitted to the eye is not as has been hitherto supposed an excellent example of reflex action, but an isolated example of normal, temporary, reflex paralysis.

I am aware that a dilated immobile condition of the pupil has been found to follow division of the third pair in animals, and that in cases of complete paralysis of the third pair, the pupil is dilated usually and insensible to light. This would rather tend to the conclusion that the contraction of the pupil under light is due to the motor oculi; but in division of this nerve, so many tissues are injured at the same time as to render deductions from effects observed open to many fallacies, while in cases of paralysis of the third pair, we not unfrequently observe the pupil to act partially under the influence of light; and where this is not the case, the immobility may be due to degenerative changes in the nervous or muscular tissue. For a thorough solution of this question, further experiments and clinical observation are necessary.

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