ON
PARALYSIS OF THE INTERNAL MUSCLES
OF THE EYE

(OPHTHALMOPLÉGIA INTERNA).

A GROUP OF SYMPTOMS WHICH PROBABLY INDICATES
DISEASE OF THE LENTICULAR GANGLION.

BY

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I AM not aware that any observer has as yet associated any group of symptoms with disease of the lenticular ganglion. Nor am I in a position to prove by an appeal to dissections that any group of symptoms can beyond doubt be so associated. The object of the present paper is, however, to point out that a certain combination of signs would be likely to follow destructive disease of that body; and secondly, to show that we do meet with cases in which precisely this combination is present in the most definite and remarkable manner. All the patients in whom I have seen it are as yet living, and I have therefore had no opportunity for post-mortem dissection.

The lenticular ganglion receives branches from three sources, two of them motor, and one sensory; the third nerve, the vaso-motor, and the fifth. The distribution of the sensory filaments proceeding from the ganglion cannot easily be identified in bedside observation, since the front of the eyeball receives nerve-supply from the other branches of the fifth, and it may be conjectured that no appreciable anæsthesia would result from destruction of the small filaments which pass into the ganglion. The motor roots, however, supply important structures, the iris and ciliary muscle, paralysis of which can easily be appreciated.

The symptoms which *à priori* would be expected to result from destruction of the lenticular ganglion are iridoplegia or paralysis of the iris, both as to its circular and radiating fibres, and cyclo-plegia or paralysis of the ciliary muscle. My suggestion is that when this triad of symptoms is present—inability to use the ciliary muscle, paralysis of the dilating fibres of the iris, and paralysis of the contracting fibres of the iris,—without any other form of orbital paralysis, the seat of disease can be in no other structure than the ganglion itself.¹ The diagnosis depends equally upon the presence of all three, and the absence of all others. If for instance any of the recti muscles are affected also, we are at once carried further back to the trunk of the third or sixth nerve; and if only one or two of the separate symptoms forming the triple group were present, the inference would be ready that the disease might be seated either in front of the ganglion or behind it in the trunk of the nerve involved. The ganglion itself is the only place where the two motor nerves (third and vaso-motor) are in contact, and where both may be affected by disease which does not involve any other parts.

¹ My only hesitation on this point is as to whether in some cases the same symptoms may be due to disease near the nucleus of the third nerve. It is not easy, however, in such cases to see why the vaso-motor should be affected. I have, however, seen the pupil motionless and accommodation lost in some cases in which the disease was believed to be in this position; always, however, there were other complications.

Clearly, then, it is easy to state beforehand what are the symptoms that ought to follow destructive disease of this ganglion, and to see that they could scarcely be caused by disease located anywhere else.

The second part of my task is to show that there are cases in which this precise group of symptoms is met with, and afterwards I shall have to make some suggestions as to the probable nature of the disease in question.

Of the three structures named it is probable that the circular or constrictor fibres of the iris are supplied solely by the third nerve, that its dilator or radiating fibres are innervated solely by the vaso-motor, and that the ciliary muscle although perhaps dependent in some degree upon both nerves for perfection of function, is chiefly supplied by the third. Any one of these muscular structures may be paralysed alone, and although combinations sometimes occur which it is difficult to interpret,¹ yet it is beyond doubt that the vaso-motor nerve may be wholly paralysed without cycloplegia, whilst the latter is a usual concomitant of dilated pupil due to paralysis of the third nerve.

The first case which drew my attention to this subject occurred in 1865, and was one of the most important that I have seen because the disease was slowly aggressive, and I was able to watch its several stages. The patient was a clerk (Mr. C—), æt. 34, when he first came under care. In the *left* eye the pupil was contracted owing to complete paralysis of the radiating fibres of the iris; he also had difficult accommodation with the same eye. He remained under my observation till 1868; at which date in the *left* eye iridoplegia was complete, and accommodation wholly lost,

¹ Although probably by far the greater part of the motor-nerve supply to the iris and ciliary muscle passes through the ganglion, it is not certain that these structures are wholly dependant on that body. Experiments in dogs make it seem probable that some vaso-motor twigs to the dilating fibres of the iris pass with the long ciliary, and never enter the ganglion. It may be so in man, and, within limits, the anatomical conditions may possibly vary in different individuals.

whilst in the *right* there was complete iridoplegia, but accommodation was still good. There was a remote history of mild syphilis, but although iodide of potassium was given no benefit followed, and the symptoms slowly advanced.

My next case exactly resembled the early stage of the one just recorded, but my notes do not extend over any long period, and I cannot therefore assert that the loss of accommodation ever advanced quite to completeness.¹ The patient, a gentleman, æt. 35 (Mr. E—), came under my observation in April, 1867. In his *left* eye the pupil was absolutely motionless and accommodation much weakened; with a + 15 lens he read No. 1 Jaeger easily. The other eye was perfect. He appeared to be in good health and denied all history of syphilis. He had suffered severely from sciatica. None of the recti muscles were defective. In a bright light the pupil of the paralysed eye was a little larger than that of the other, but in the shade this relation was reversed, the paralysed pupil remaining stationary while the other dilated.

CASE 3.—In April, 1869, a woman (Mrs. T—), æt. 44, who had been under my care for primary and secondary syphilis in 1865, but had in the interval been quite well, came to Moorfields on account of sudden failure of sight in both eyes. Her pupils were of moderate size, and so extremely sluggish that I was in doubt whether it could be said that they acted at all. She assured me that until three weeks before she could see to thread her needle perfectly, and that the loss of ability to do so had been quite sudden. With + 16 glasses she could just manage to read No. 1 Jaeger; her distant vision also was not quite perfect, in consequence perhaps of some small films which were present in the vitreous of each eye.

CASE 4.—*Complete symptoms of disease of lenticular ganglion in left, partial irido-plegia with weak accommodation*

¹ This case has been published in rather more detail in vol. vi of the 'Ophthalmic Hospital Reports,' p. 142.

in right.—Elizth. B—, an unmarried servant girl, who furnished the subject of this important case came under notice in June, 1873. In the *left* eye there was complete paralysis of the iris and ciliary muscle, whilst in the *right* the pupil was very sluggish, but the ciliary muscle was unimpaired. Not the slightest movement of the left iris could be provoked even by exposure to the strongest light. With a + 7 glass she read 1 Jaeger easily. It was probable from her statements that the symptoms had been slowly advancing for six months. She had suffered from much pain across the forehead. I did not ask the direct question as to syphilis, and I failed to detect anything about her in support of such a suspicion. Although in the *right* eye her power of accommodation seemed for the present nearly perfect, she said that the eye soon tired; and it was her impression that it was failing just as the other had done. This patient attended at Moorfields from June 19th to Oct. 2nd, and took throughout iodide of potassium in five grain doses. At the latter date she had so far improved as to be able with the *left* (paralysed) eye to read No. 4 Jaeger, although not easily. The pupil of this eye was still rather larger than that of the other (in a bright light). No further evidence had been obtained as to its possible cause.

CASE 5.—My fifth case is that of a gentleman, æt. 35 (Mr. T—), who discovered that his *right* eye was failing in 1861.

He consulted an eminent ophthalmic surgeon; his symptom being a certain inability to read whilst vision for distant objects remained good. This eye never regained its power of accommodation, and he was obliged ever afterwards to depend wholly upon the left for reading. Some time later the right eye began to diverge, and for troublesome diplopia he came under my care in April, 1869.

I found his *right* eye slightly divergent, its pupil absolutely motionless, and the function of accommodation lost. With a + 12 glass he read No. 1 Jaeger easily with the affected eye, and the sight of this eye for distant test-types was perfect without a glass. It appeared that the superior,

inferior, and internal recti were all in a slight degree weakened. His other eye was not in any way affected, except that it presented a low degree of myopia. He denied any history of syphilis, and I could detect nothing suspicious. His face was covered with acne. He was subject to "rheumatic aching in the limbs." He had suffered from certain other nervous symptoms, thus, he was liable to a nervous cough which sometimes produced vomiting; he often had severe sick headaches; about a year ago he suffered an attack of most violent neuralgia in the face lasting a few days. These were the only items of evidence I could get in reference to his predispositions. It will be seen that the symptoms had lasted in the one eye for eight years, and that the other had not suffered in any degree. It appeared not improbable that disease beginning in the ganglion had travelled backwards to the trunk of the third nerve.

CASE 6.—Mr. H—, a veterinary surgeon, æt. 36, was sent to me on June 2nd, 1875, from a town in the midland counties. In him the condition was symmetrical, and in both eyes paralysis of the iris was complete and accommodation very feeble. He had had syphilis eight years before, and the details of his attack and treatment were supplied to me by the surgeon who attended him. He had no other symptoms of nerve disease excepting constipation, flatulence, and occasional stabbing pains in his limbs. I treated him for several months but without being able to prove any benefit. Sluggishness of pupils and occasional failure of sight had been noticed for a year before Mr. H— came under my care. When I first saw this patient he read 20 Snellen at twenty feet, but could only read large print without glasses. His optic discs were quite healthy, and his sight with low convex glasses was perfect for near objects. My notes do not state the precise degree of failure of accommodation, but at a subsequent visit he saw No. 5 Jaeger with one eye, and No. 8 with the other. His reason for applying to me was that he could not see to read or write efficiently. The cycloplegia was, however, neither complete nor constant;

thus, at one of his visits to me he managed with great effort to puzzle out a few words of No. 1 Jaeger. This was after some months' use of mercury and iodine, and after he had somewhat improved. His pupils remained throughout absolutely motionless; I tested them in sunlight and used a lens. The stabbing pains mentioned above had been severe enough to suggest the possible commencement of locomotor ataxy, but there were no symptoms conclusively indicative of that malady. He compared the pains to the pricks of a knife, and said that formerly they had occurred chiefly at night and would often keep him awake. His lower extremities were the parts usually affected. He got rid of these pains under iodide treatment, and is now, I believe, quite well.

Hitherto I have not been able to record in any single case that a cure has occurred. In the following instance, however, it seems highly probable that one of the three functions has been regained, since "paresis of accommodation" had been diagnosed four years before the patient came to me, and from this he had almost wholly recovered when I saw him, the iridoplegia, however, remaining complete.

CASE. 7. In which twelve years after syphilis the ciliary ganglion of one eye was affected, and recovery of the function of accommodation with permanent iridoplegia resulted.—This case is one of especial interest because I am able to feel certain as to the patient's antecedents, and also to state the result of treatment. The patient came under my care in May, 1871, and again on Oct. 8th, 1876.

Mr. S— was treated by Mr. H. J. Johnson, in 1860, for chancre followed by eruption, &c. He remained fairly well until 1870, when he was under Mr. Buxton Shillitoe's care for ulcers in the throat and on the tongue. At this time he also became deaf, and consulted Mr. Harvey. In May, 1871, he was brought to me by his medical attendant, Dr. Reilly, of Bow, on account of intractable syphilitic ulcers on the palate and tongue. I saw him only once, and he was subsequently under the care of different surgeons both in England and America for the same malady, always affecting

the same parts. In Oct., 1876, he returned to me having just come home from the Philadelphia Exhibition, and still suffering from sore tongue and lips. He now told me that his *right* eye had suffered about a year after his first visit to me, and that he had been under the care of one of my Moorfields colleagues on account of it. I found his *right* pupil of the same size as the other, but quite motionless whilst the left acted well. He could see almost perfectly in the distance with the *right*, but could not read so easily nor at so short a distance with it as with the other. His near point was eight inches with the *right*, and five inches with the *left*. He told me that when he applied to Mr. H— he could not see to read with the right eye at all though he could see with it in the distance, and that under treatment the sight of this eye had gradually improved. He considered that the eye was now quite well, and was not aware that the pupil was motionless. Mr. H—'s treatment had consisted in a six months' course of five-grain doses of iodide of potassium and the use of Calabar bean. I was shown Mr. H—'s hospital letter upon which "paresis of accommodation" was written as diagnosis; and on it was recorded that after the use of Calabar bean his near point with the *right* was eight inches, and that of the *left* five inches. It will be seen that we have no measure of the degree in which accommodation had failed, but Mr. H—'s expression in the note and the man's memory of his symptoms may be taken as evidence that the function was very considerably reduced.

Looking at the fact that the pupil is now motionless and neither contracted nor dilated, we may take it as highly probable that in the first instance all three functions were lost, and that the accommodation alone has been benefited by treatment. He has had no other symptoms of syphilis of the nervous system.

General summary.

Whatever may finally be thought as to the recognition of the precise part of the nervous system affected, it is apparent

that we have in the cases described in this paper illustrations of a very curious group of symptoms. The cases for the most part very closely resemble each other. In none of them was the patient very seriously ill, and in only two were there indications of disease of other parts of the nervous system. In none did the disease of the nervous system show any tendency to extend whilst the patients were under my observation, a fact, however, which may perhaps have been partly due to their having been all treated by specifics. Of the eight cases, in five both eyes were affected.¹ In three of the eight there was no history of syphilis (two men and one woman), but in none of these can the absence of history be held to prove absence of the reality. In two of these three only one eye suffered, the disease in one of them having been present eight years without showing any tendency to attack the other eye. All my patients were at an age when syphilitic affections of the nervous system are common; the oldest was forty-four, and the youngest twenty-seven when the disease began. In one case I had myself attended the patient for severe syphilis four years before the eye symptoms, and in four others there was the definite history that symptoms of constitutional syphilis had occurred a few years ago. I cannot but regard it as highly probable that in almost all cases the affection is due to syphilis.

We may note that it does not appear to occur amongst the later forms of tertiary disease, but rather during that period in which after disappearance of secondary symptoms there is usually a long period of latency.

One fact I must ask especial attention to; it is that the paralysis of the iris appears to precede the loss of accommodation, and also to resist treatment longer. In four cases it is expressly stated that the iridoplegia was first developed, and in two of them the patient regained to some extent the use of the ciliary muscle. In none was the failure of accommoda-

¹ As regards symmetrical occurrence the facts are very similar to what we find in the case of syphilitic choroiditis, in which frequently both eyes are affected, sometimes only one, and but rarely both in quite equal severity. The two conditions occur also at almost the same periods after the primary disease.

tion the first symptom, a fact the more important when we consider that it causes a condition which the patient is not likely to overlook, whereas a motionless pupil may easily escape attention. It is, I admit, difficult to explain, on the theory that the disease is in the ganglion, why the ciliary muscle and the sphincter of the pupil should suffer in different degrees.¹

It has been necessary in dealing with this somewhat intricate subject to use a number of terms some of which can scarcely be said to be in common employment. It may be convenient, even at the risk of some repetition of what I have just said, to define these and to add a few words about the conditions severally designated by each.

Paralytic mydriasis is the condition of dilatation of pupil which occurs when the circular fibres are paralysed and the dilators intact. It may result from disease in the short root of the ciliary ganglion, or in the trunk of the third nerve, or in the brain itself. When present alone it may be presumed to be due to disease in the short root. As an uncomplicated condition it is very rare.²

Paralytic myosis is the condition of contraction of the pupil which occurs when the radiating fibres are paralysed, the circular ones remaining intact. It results from disease of the vaso-motor root of the lenticular ganglion or from disorganisation of the trunk of the vaso-motor nerve in the neck, or from disease or injury to the brachio-cervical region of the spinal cord. It is seldom in such a case that the pupil is contracted in any marked degree, unless the circular fibres are thrown into spasm: a condition of simple inability to dilate but without any special contraction is the common result of paralysis of the vaso-motor. As a consequence of

¹ Is it not reasonable to suggest that the disease of ganglion acts at first by simply weakening the nerve currents which traverse it, and that a current which may be too weak to reach to the iris may still get as far as the ciliary muscle?

² When mydriasis occurs with cycloplegia, and without other complication, it may be conjectured that the third-nerve root of the ganglion is diseased. I have notes of several cases in which this diagnosis was given. I have never seen both eyes affected.

injuries to the cord or to the sympathetic trunk in the neck paralytic myosis is not uncommon, and is usually combined with narrowing of the palpebral fissure and retraction of the eyeball. When not so complicated it may probably be due to disease close behind the ganglion.

Irido-plegia is a term applicable to total paralysis of the iris, both of its circular and radiating fibres. It is usually an indication of disease in the lenticular ganglion, and is then commonly combined with cycloplegia. It may at times occur from disease in the centres, but when such is the case other combinations might be expected.

Cycloplegia denotes paralysis of the ciliary muscle, and is expressed by loss of power of accommodation. In young and middle-aged persons it is easily appreciated, the necessity of a strong convex glass for reading (+ 10 or + 12) being conclusive. Cycloplegia occurs often, without combination with other ocular paralysis, after diphtheria, but in all other conditions it is rare excepting with paralysis of the iris. It does not occur, or at any rate is not complete, when the vaso-motor trunk in the neck is paralysed. We may presume that the ciliary muscle is supplied almost solely by the third nerve, but perhaps partly by the vaso-motor.

Ophthalmoplegia interna is a term which may perhaps be conveniently used to indicate a state of paralysis of all muscular structures within the eyeball (both sets of fibres in the iris and the ciliary muscle), and excluding all the external or orbital muscles. It is the symptom, or combination of symptoms, with which the present paper is concerned, and when it is present without any addition I claim that in all probability it denotes disease located in the ciliary ganglion.

A few words, in conclusion, on the general bearings of the subject may perhaps be permitted. Pending the results of post-mortem dissection it must still remain doubtful whether the group of symptoms which I have described is due to disease in the peripheral ganglion or in some central nucleus the position of which is not yet known to anatomists. If we accept, as I think we may safely do for the present, the

hypothesis that the ganglion is its site, we have, then, tolerably conclusive evidence that it is possible for syphilis (and perhaps other causes of disease) to attack and disorganise the separate ganglia connected with the vaso-motor system. If the lenticular may be thus involved why not Meckel's or the otic, why not any one or any pair of the cervical or thoracic ganglia? Our task in the future must be to seek out and identify the groups of symptoms which diseases of each of the ganglia separately or of many together would produce, and it may easily be that here we shall find an explanation of some symptoms which have as yet been regarded as anomalous.

Another line of investigation in the future will be as to whether when disease has begun in a peripheral ganglion there is much tendency for the morbid process (probably a neuritis) to travel along the nerves and involve other trunks or even reach the central nuclei. In two of my cases something of this kind appeared to have happened, for the patients who began with ophthalmoplegia alone had subsequently paralysis of the third. In none others was there any tendency shown to invade other nerves, but as already stated it must be remembered that all the patients were treated with specifics. There is another group of cases which I hope to have the honour at an early opportunity of bringing under the notice of this Society in which all the external muscles of both eyeballs become either in succession or simultaneously partially paralysed, and for which I shall venture to propose the name *ophthalmoplegia externa*. This affection is usually due to syphilis, and in it probably the centres are affected. It curiously and unexpectedly happens that in it the *internal* muscular apparatus of the eye often escapes. In one case, however, which is included in the appended table, the internal paralysis in a complete form preceded that of the external muscles, but as a rule it is remarkable that the two affections, although due to the same cause, keep distinct.

A contracted and sluggish pupil is a well-known symptom of locomotor ataxy, and often an early one. It is probably caused by defect in the vaso-motor fibres, and is not usually

attended by failure of the ciliary muscles. In one or two of the cases which I have mentioned symptoms were present which suggested the possibility that ataxy was threatened, and in connection with this subject we must recollect that several French observers, M. Fournier most prominently, have adduced facts in favour of the belief that this malady is in many cases due to syphilis. My own experience quite supports M. Fournier's statements, but it is to be remembered that to both of us probably only special forms of ataxy have been presented. Whether or not ophthalmoplegia interna is often met with in association with ataxy must be left for further investigation, but the facts as at present known would not favour such a suspicion.

I must finally add a word of apology for the endeavour to introduce a new term into use. I am well aware of the inconveniences of a loaded nosology, but as I feel confident that the group of symptoms described is a definite and important one I feel justified in suggesting for it a distinctive name. Whether this course is desirable and whether the proposed name is a good one must be left to the decision of the future.

A tabular statement of the cases which have occurred in my experience is appended overleaf.

Table of cases of ophthalmoplegia interna.

No.	Name.	Age.	History as to syphilis.	One or both eyes.	Eye first affected.	Remarks.
1	Mr. C—,	34	Mild syphilis some years before	Began in one and afterwards affected both	Left	Iridoplegia preceded cycloplegia in each eye. (Notes extend over two years.)
2	Mr. E—,	35	No history of syphilis	One	"	Iridoplegia preceded cycloplegia. (Only a single observation.)
3	Mrs. T—,	44	Syphilis four years before	Both	Simultaneous	Iridoplegia and cycloplegia coincident.
4	Elizabeth B—, single	27	No history of syphilis	Left complete, right threatened	Left	Slight improvement under a course of iodide.
5	A gentleman	35	Iditto	One only	Right	The condition had persisted eight (? 18) years. Some weakness of third-nerve recti.
6	Mr. H—, Veterinary Surgeon	36	Had had syphilis eight years before	Both	Uncertain, perhaps simultaneous	Iridoplegia complete; cycloplegia partial and somewhat variable under treatment.
7	Mr. S—,	37	Had suffered severely from syphilis	One only	Right	Recovered from cycloplegia, the iridoplegia remaining.
8	A sailor	...	Syphilis mildly years before	Both	Simultaneous	With paralysis of all the eye-muscles. The lenticular paralysis had probably preceded that of the recti by several months. (I have not mentioned this case in the body of the paper.)