THE NON-TOXIC AMBLYOPIAS.*

T. W. MOORE, M.D.

HUNTINGTON, W. VA.

I believe that the non-toxic amblyopias can be better studied if considered under three heads: 1. Those cases of amblyopia exanopsia due, as is usually believed, to the inability to use corresponding areas of the retina at the same time. This may be due to high refractive errors, to improper balance of the extraocular muscles, or to a non-development of the fusion center in the *cerebrum*.

2. That large group characterized by irregularly contracted but constant fields, impaired vision with careful tests, often only perceiving moving objects, but never interfering with locomotion or similar acts, frequently monocular diplopia, etc., etc., and known as the hysterical amblyopias.

3. That similar but sufficiently different group to justify their place in a separate class, characterized by impaired vision, contracted fields for white and colors always retaining their normal relationships, i. e., no reversal, and being proportionate to the visual acuity; these cases are usually designated as anesthesia of the retina.

Then, lastly, we have the group due to traumatism, often where there is evidence of pathologic changes of the fundus in the form of an old rupture of the choroid or retinal hemorrhage that has left the parts of the fundus uninvolved healthy, *but vision has not returned*. These cases are closely allied to the group just preceding, differing only in their etiology and the limited results that can be brought about by treatment.

The diagnosis of the cases of amblyopia exanopsia is not usually difficult, the defective vision, the apparently normal fundus, the one eye squinting frequently, and the high refractive error in one or both eyes usually renders the case clear from the first. It is difficult to decide whether the squint is due to the defect in vision or the reverse, but in a large proportion of cases the former is doubtless the case.

What shall we do in these cases? I do not believe, when we prescribe lenses and turn the patient away without any other treatment or advice regarding the amblyopic eye, that we have done our full duty, providing the patient is under 40 years of age. Of course, the younger our patient the greater the chances of bringing about permanent improvement, but cases like the one recently reported by St. John Roosa, where a man of 46 lost his seeing eye, and after five years the vision in his amblyopic eye had improved from 20/200 to 20/30 with an appropriate lens, the near vision improving much more rapidly than that for distance, and the several cases of this kind found in ophthalmic literature encourages us to try to improve these eyes.

I have tried numerous devices, such as covering the good eye for one or two hours daily, the amblyoscope, etc., but have found the convex glass cure, as recommended by Frommüller in 1857, the most satisfactory. I can not do better than to quote his directions in full:

In this sort of exercise, printed types are best suited as visual objects, since in them there is a change from letter to letter, and, therefore, the attention must be directed uninterruptedly to the object, and mistakes, which have slipped into the estimate of what is perceived, appear immediately by the context, and therefore, invite correction. These printed types must, of course, be well illuminated, and must more-

over, be projected on the retina under a large visual angle, in default whereof they appear, even in slight torpor of the light-perceptive apparatus, as images which can not be deciphered. They must, therefore, be chosen large, and brought near the eye. But in order to see as clearly as possible at short distances, convex glasses are usually needed, as the amblyopia exanopsia is, as a rule, accompanied by weakness of the apparatus of accommodation. Convex glasses are, moreover, under all circumstances very useful, as, by an apparent brightness of the retinal images, they increase the distinctness of the perceptions and facilitate the choice of test-types. It is, therefore, the custom to employ them in all cases, at least at first, and to distinguish the exercise in general with the name of treatment by convex glasses. The weakest convex glass must here be first ascertained, which enables the affected eye, the other one being closed, to decipher larger printed types (Jaeger, No. 12-20) at a distance of from 8-12 inches. With this glass the patient must now undertake, two or three times a day, exercise in reading, at first for five minutes, but gradually increasing the time, but should never push the attempt so far as to excite symptoms of fatigue, pain, congestion, or inflammation. On the whole this method of treatment, particularly in the higher degrees of amblyopia, demands in many cases great patience and perseverance, as it is often very long before any perceptible effects make their appearance. Finally, however, the power of vision often increases in favorable cases in very rapid progression. It is then time to pass to weaker glasses, and by lengthening the periods of exercise to rise to smaller and smaller test-types. Sometimes the progress is all at once arrested, and the power of vision does not improve, in spite of all that can be done. We should not then lose courage! for all at once it again advances, and we finally are able to employ glasses which are weaker by many numbers, or we may even reach a point where glasses are found to be superfluous. If the eye has become so far cured that ordinary printed type may be read fluently with weak convex glasses or without any, the reading exercise must still be continued for a time, in order to confirm the cure, and prevent relapses.

In some of these cases my results have been surprisingly good, in others less so, but in all cases where I could command the co-operation of the patient there has been some improvement.

With the hysterical amblyopias the diagnosis is, as a rule, not difficult, the concentrically narrowed field of vision with reversal for colors being characteristic. There are diseases in which we have this contraction, such as atrophy of the optic nerve and glaucoma, but without the reversal for colors. It may seem superfluous to call attention to this, but in their incipency it often taxes the resources of the most skillful to say whether a disc is normal or not, and it is here that the exact perimetric measurements give us valuable aid, for in the nervous types the degree of contraction is practically equal in all meridians, whereas in the diseases mentioned it usually advances, with irregularly reentering angles toward the point of fixation, as is so tersely pointed out by Swanzy.

Parinaud says:

This concentric contraction of the field is also found in some cases of cerebral tumor and without neuritis, or it may result from intracranial pressure associated with certain forms of extensive cerebral meningitis; also it is not infrequently observed in epilepsy, and in this latter disease the diagnosis is often difficult, especially where there is temporary amaurosis, which is undoubtedly a manifestation of epilepsy, but unaccompanied by convulsive attacks. This is the same condition that Feré reports as characteristic of the amblyopia following epileptic attacks, i. e., the contracted field not accompanied by dyschromatopsia, especially the peculiar inversion of the color field.

The varying, never constant symptoms usually mani-

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festated by all hysterical subjects should be remembered, especially the symptoms of the hysterical amblyope, such as the contracted field with reversal for colors, the varying degrees of diminished vision, frequently monocular, the failure of accommodation, the scotoma and hemiopia, and the less frequent photophobia, blepharospasm, ptosis, etc.

The treatment consists in building up the patient's general health, by cold baths, plenty of outdoor exercise, tonics, electricity, the correction of any error of refraction, etc. These cases all recover, but some of them tax our skill and patience to the uttermost.

Then, we have those cases known as anesthesia of the retina, of which etiologically we have two classes, those of unknown cause and those due to traumatism. Charcot and Leber have asserted that these cases are of a hysterical character and place the seat of the disease in the brain and not in the retina, but do not the results of treatment prove that the trouble is in the retina?

These cases, as recently pointed out by Fox, are characterized by partial loss of vision for near and distance, contracted fields with retention of the normal color relationship, i. e., no reversal. The fundus is normal and refractive errors usually very slight. This usually comes on suddenly, but there may be a gradual loss of vision, and this is not accompanied by photophobia, blepharospasm, anesthesia of the cornea, etc., as the hysterical cases so often are. The traumatic cases are seen after the patient has recovered from an injury, such as a blow on the eye from a fist, or a cork from a bottle, etc. There is usually considerable amblyopia, with concentric contraction of the field, which may continue for a long time, while the ophthalmoscopic appearance may be normal; or there may be a lesion, such as rupture of the choroid, but the lack of vision is much greater than the ophthalmoscopic lesion leads us to expect.

I probably can illustrate better by describing a case recently treated:

Nellie F. was shot with a rifle ball over the right eye, October 8; two weeks later the ball could be felt on the crest of orbit at junction of outer and middle thirds. Small pigment spots could be seen in peripheral portion of retina and a small horseshoe shaped line of pigment about as large as the disc and on the nasal side of same. November 2 she counted fingers at $5\frac{1}{2}$ feet; on January 7, fingers at 3 feet; after using high frequency current five minutes, at $5\frac{1}{2}$ feet; January 11, fingers at 8 feet; after high frequency, 12 feet; January 14, fingers at 18 feet; after high frequency, 20/200. This continued until March 1, vision having reached 15/120, but could not be improved beyond this.

I do not think that there is any doubt that there existed anesthesia of the retina due to traumatism. Of course, there was, in addition, a rupture of the choroid, as shown by the ophthalmoscope, which accounts for the limited improvement.

The treatment of these anesthetics is electricity, which cures all the non-traumatic cases and benefits them; and, while the galvanic current seems to meet all the requirements, the faradic and high frequency are equally as efficient, and I think the latter is the most useful. The electrode should be applied over the closed lids, when the unipolar current is used. The bipolar is equally efficient. In applying the latter the patient can hold the other electrode in his hand. With the reflex amblyopias due to irritation of branches of the fifth nerve and other causes, such as intestinal parasites, I have had no experience.

DISCUSSION.

DR. G. C. SAVAGE, Nashville, stated that within the past two years he has had under his care a patient who goes to prove that the amblyopia of squint is mental and not ocular. The patient was a railroad man, but how he got into the service Dr. Savage does not know. He had one blind eye and one good one, the blind eye turning in toward the nose. He was on a train approaching Nashville, going up a steep grade, when a cinder penetrated the cornea and lens, producing a traumatic cataract in the good eye. The next morning he was taken to Dr. Savage's office almost entirely blind. The lens grew more and more opaque. In the meantime he had only the other eye to depend on, and it swung straight while the injured eye turned in toward the nose. In less than ten days the vision arose from 10/200 to 20/30. Every one of these cases should impress on physicians the fact that the blindness of the squinting eye is mental and not ocular. The first thing that should be done is to correct the muscle error, not by complete tenotomy, but by partial tenotomy and advancement, then the physician will never be confronted later by that patient with one eye looking in the opposite direction. The patients should be treated by operative measures first, and then the vision in the blind eye should be developed. The amblyoscope is, of course, a splendid instrument for that purpose. Atropin may be used in the good eye so that near vision with it will be impossible. Dr. Savage emphasized the necessity for first correcting the focal and muscle errors, thus making it possible to have binocular single vision, and then beginning training the blind eye. Dr. Savage mentioned a case of hysterical amblyopia. About six years ago a woman became totally blind in both eyes. Her actions led Dr. Savage to believe that the condition was hysterical. Pupillary reaction was gone. He told her with great positiveness that she would recover, that she would not be long in recovering, and that she would recover just as suddenly as she had lost her sight. One evening, when she was brought in by her sister, he said, "If you are not seeing by morning I am going to have you hypnotized." That night he received a telephone message to come to the boarding house where she was stopping. The patient was sitting there happy and radiant, and seeing as well as she had ever seen in her life.

DR. DUDLEY S. REYNOLDS, Louisville, said that a very common class of cases which, if not entirely ignored, are at least accorded insufficient attention are those cases of injury due to concussion, railroad accidents, trauma amblyopias. In these cases there is gradually increasing peripheral limitation of the field of vision and at the same time there is gradual reduction of the acuity of perception. He has known of cases of this kind in which no recognition of the nature of the trouble occurred for a year or for a year and a half after the accident, when it was noticed by the patient that the field of vision was narrower, or that acuity of perception was obtunded. Dr. Reynolds disagreed with Dr. Moore that no ophthalmologic indications are present. While these may be slight, they are nevertheless distinct. He is sure, too, that amblyopias that are non-toxic traumatic amblyopias, are not benefited by any form of treatment. They are very common and in some instances progressive, leading to entire or nearly entire blindness.

DR. WILLIAM CAMPBELL POSEY, Philadelphia, spoke in favor of the amblyoscope in developing vision in the squinting eyes of children. He has used it a great deal in the last few years and has found it a very valuable means of re-establishing binocular vision. In order that the treatment with this instrument should be efficacious, it is necessary that it should be employed before the child has arrived at the age of six years; if it be postponed until after that age the results will be disappointing. It should be remembered that treatment for the correction of squint can not be begun too early, and even at the age of one year, if the squint has been diagnosed, atropin should be used in the good eye, with a view to blurring its vision and inviting the patient to use the squinting eye. Some clinicians instill atropin into both eyes. While when used in this way the spasm of accommodation may be overcome and the relationship between accommodation and convergence re-established, the vision in the squinting eye is not

improved, and the chief value which may be gained from the employment of the drug is not attained. At the age of 2 years the proper glasses should be put on the child, the lenses being selected by retinoscopy. Mr. Worth orders glasses at even a younger age, but Dr. Posey thinks that as the frames must be bound on the head by tapes, there is some danger in such young subjects, in interfering with the proper development of the bones of the face, and possibly with the eyes themselves, from pressure. The amblyoscope may be used at the age of 3 or 4 years, and if employed persistently, the results obtained are very gratifying.

DR. S. D. RISLEY, Philadelphia, declared that, in the management of squint occurring in early childhood we should not be unmindful of the somewhat limited group of cases in which the convergence is not due to the usual error of refraction, but is associated with, and probably caused by a central blind spot. It is not possible to demonstrate the presence of this in very young children, but its existence should be suspected when the well-known methods of treatment fail to correct the deviation. Dr. Risley has a number of times been able to verify this diagnosis after the child was old enough to permit a demonstration of a macular scotoma. He agreed with Dr. Posey and Dr. Moore that all cases of strabismus, when the deviation is due to refraction error, should be corrected by glasses very early in life. When seen early and when the correction is accurately made, there need be but little difficulty in securing binocular vision, even without the aid of the amblyoscope. Dr. Risley expressed surprise to hear Dr. Savage give credit to Dr. Worth for devising the use of atropin in the good, or fixing eye, to compel the use of the deviating eye. Dr. Risley has used the drug in this manner during his entire experience and the method did not originate with him so far as he knows. He called attention to the fact that in amblyopia of the deviating eye impaired vision may be due to the peculiar error of refraction, or to commencing disease in the macula, and the apparent amblyopia disappear as soon as these are corrected. Which eye shall deviate may be determined by the greater impairment of vision produced by the higher refraction error or by asymmetrical corneal meridians, for example; or it may be by a faulty attachment of one or more muscles to the globe, a condition which is often foreshadowed by certain deformities in the skull which lead to abnormalities in the shape of the orbit. It is obvious, therefore, that in the study of strabismus or other defects of ocular balance each case must be considered separately. We can formulate no law by which all cases are to be compared. We can not hope to secure by Worth's amblyoscope, or by any other instrument, binocular single vision until the refraction error has been accurately corrected, and not then in the presence of macular scotomata, or in cases where the anatomic relation of the muscles is at fault. In these last named cases the only hope is in prudent surgical interference.

DR. LEARTUS CONNOR, Detroit, stated that there is another class of cases, perhaps somewhat rare, in which nothing appears to account for the amblyopia occurring after previously good sight other than malnutrition, presumably of the retina. A year ago last October a man over 60 years old came to Dr. Connor with a history of good health previous to the past four months, when he had been gradually losing sight, until his vision was reduced to 6/200 in one eye and 8/200 in the other. The ophthalmoscopic image showed nothing except that the retinal artery was distinctly smaller in either eye than normal. The field of vision was very decidedly restricted. The refractive errors had been perfectly corrected. The only thing that constitutionally seemed to have any bearing on the case was a persistent indigestion. Dr. Connor employed vibratory massage on the eyeball and within a month vision was 20/200, and at the end of three months the patient could read Jaeger No. 1 and had 20/20 vision for distance. The only two factors observed in the case were the diminished blood supply to the retina and the poor digestion. The case puzzled Dr. Connor at the time and he is not absolutely clear about it yet, but the patient's improvement certainly followed the improved nutrition of the retina. Putting this observation with others, Dr. Connor is inclined to think

that in not a few cases there is impaired digestion and interference with nutrient processes which tend to diminish the power of the special senses.

DR. T. W. MOORE said that from Dr. Savage's remarks he inferred that Dr. Savage has been able to produce binocular vision in these cases in which the patients were over 6 years of age. Dr. Moore has tried it in a few cases, but has absolutely failed. He thinks that has been the usual result. Recently he has only tried to increase the vision in the blind eye in patients over 6.

EXPERIMENTAL AND CLINICAL EVIDENCE OF DYNAMIC (SPASTIC) ASTIGMATISM.*

F. B. EATON, M.D.

SAN FRANCISCO.

Dynamic astigmatism may be defined as a condition of the eye due to dynamic changes in its media which prevent homocentric rays from being brought to a focus on the retina.

That such dynamic changes occur there is a preponderance of evidence and opinion on the part of Javal,¹ Georges Martin,² Landolt,³ Dobrowolsky,⁴ Oliver,⁵ Noyes⁶ Panas⁷ and others. Among authors who deny this condition I note only Bull⁸ and Tscherning.⁹ The authors in the first group, while stating briefly a belief in the existence of the condition, are nearly all silent as to its clinical significance, implying, apparently, indifference to it in this respect.

As far as I know, no one has gone so carefully and exhaustively into the subjective phenomena pointing to dynamic astigmatic contractions as Georges Martin¹⁰ of Bordeaux, who published a series of papers entitled "Etudes sur les Contractions Astigmatiques du Muscle Ciliaire," which were afterward collected and published in a small volume of about 200 pages. He records in detail about 150 cases in 300 eyes, and the volume is dedicated to Javal and Schiotz. In it the subject is presented with the utmost minuteness of observation and

* Read in the Section on Ophthalmology of the American Medical Association, at the Fifty-sixth Annual Session, July, 1905.

1. *Annal. d'Oculistique*, t. 88, p. 33, July, 1881, p. i.

2. *Ibid.*, 1886-1887.

3. *Refraction and Accommodation of the Eye*, pp. 301, 302.

4. *Arch. f. Ophth.*, xix, p. 51, 1868.

5. *Norris and Oliver*, vol. iv, p. 420.

6. *Diseases of the Eye*, 1890, p. 111.

7. *Traité des Maladies des Yeux*, vol. i, p. 141.

8. *Annal. d'Oculistique*, Feb., 1892.

9. *Optical Physiology* (English Transl.)

10. *Annales d'Oculistique*, 1886-1887.