

The non-operative treatment of strabismus / George M. Gould.

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Publication/Creation

[Chicago] : [publisher not identified], [1902]

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THE NON-OPERATIVE TREAT-
MENT OF STRABISMUS : :

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THE NON-CONFORMIST
WENT ON WARRIORS

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THE NON-OPERATIVE TREATMENT OF STRABISMUS.*

GEORGE M. GOULD, M.D.

PHILADELPHIA.

In 1893 at the meeting of the Ophthalmic Section of the Pan-American Medical Congress, when operative treatment of heterophoria was universally practiced by American oculists,¹ I ventured to say that it seemed to me unphysiologic, unnecessary, without analogy in the treatment of similar incoördinations elsewhere in the body, requiring an impossible delicacy of execution, without definite prognosis, and unsatisfactory in result. In the *Medical News* of Oct. 14, 1893, and Nov. 18, 1893, I stated more fully my reasons for the extempore statements, and the methods I had found successful instead of tenotomies, graduate, undergraduate or post-graduate. I think that there are to-day extremely few tenotomies performed for heterophoria, in comparison with the thousands that were being performed.

Following the reaction against the operative furore in heterophoria there has arisen a wise restraint in operations for strabismus.² As I have nothing to recant concerning the absolute inutility of operations in heterophoria, so I expect to have nothing as to a similar conviction concerning operations in strabismus. Catch the

* Read at the Fifty-third Annual Meeting of the American Medical Association, in the Section on Ophthalmology, and approved for publication by the Executive Committee: Drs. Frank Allport, H. V. Würdemann and J. A. Lippincott.

1. The greater part by far of the work of the American specialist in diseases of the eye is not surgical. It is distinctly higher and nobler than surgery; it is the prevention of disease, and it is also chiefly medical in curing patients of systemic disease. Let us therefore disallow the term ophthalmic surgeon, and call ourselves ophthalmologists, or, because it is shorter and better, oculists.

2. Let us always say strabismus instead of squint. The latter word has a number of incorrect and absurd meanings in the lay mind.

babies early enough and no operation will be needed, provided that requisite intelligence, patience, and conscience are brought into play. In my private practice I have in six years seen no case that I believe needed operation, and I have seen none benefited thereby—at least none that could not have been more benefited by other methods of treatment. In the limits required for our papers I can not set forth in detail the requisite proofs of this statement, which will undoubtedly seem as extreme to many as was the similar statement made nine years ago as to heterophoria. Those who still operate for heterophoria will, of course, deny the contention, but for those who do not operate in heterophoria the epitome and essence of my experience and of all I shall have to say is contained in two statements, which I believe to be incontrovertible truths:

1. *All strabismus is preceded by heterophoria*; intervene during this heterophoric or latent stage and every case is preventable. The duty of every good physician is to prevent disease. The heterophoric stage arises so early in life and may be so short in duration that the period of therapeutic opportunity may have passed without notice. But there will still remain a stage when rescue is possible, because even in the most fulminant cases nature will struggle against ruin, and preserve possibilities of cure for a long time.

2. *All chronic or permanent strabismus is preceded by a stage of acute, functional, or incomplete strabismus*, during which there has not been an utter renunciation or annihilation of the means and mechanisms of binocular vision. In this stage there is such a mixture of heterophoria and heterotropia that the condition is not describable by either name and to designate it properly we must use some such terms as exophoria-exotropia, esotropia-esophoria, hyperphoria-hypertropia, etc. During this period, long or short, according to the infinitely varying conditions, the physician's intelligent coöperation with the subtle wisdom and clinging to hope of the child's unconscious cerebral organism, will save the eye from ruin, preserve binocular vision and prevent deformity.

The chief duty of every good physician is to prevent disease. Surgery, the despair of medicine, has place only when prevention and natural methods of cure have been exhausted. The education of the community, therefore,

becomes our highest obligation. The best method of education as to strabismus consists in demonstrating the fact by prevented and cured cases, that operation is not necessary. Every good oculist has hundreds of happy patients who have no deformity and who have binocular vision—so long as their spectacles are in place. Raise the lenses and instantly there is strabismus! That is a demonstration convincing to every one. I know of no more heinous sin of ophthalmologists than one that has been and still is revealed almost every day in my practice, the sin of telling parents that operation will be required but not before the child is seven or nine years old. At that late age, generally speaking, irreparable injury may have been done. The neglected hyperopia, astigmatism, or anisometropia may have produced the irremediable amblyopia, loss of innervation, psychic suppression of the image of one eye, etc.

I am not supposed to go into the question of the cause of strabismus, but, as all my treatment is based upon a theory, I may say that for all practical purposes, i. e., with unimportant exceptions, in the cases under discussion the poor abused muscles and tendons are not abnormal as a causal agency. All "myology" resolves itself, of course, into neurology. The incoördination of innervation which causes all heterophoria and strabismus is a functional disease, and is caused by the fact that the peripheral organs are so optically dissimilar and defective that binocular vision is impossible. Anisometropia and astigmatism are the initial sources of the impossibility of binocular vision, in the vast majority of cases.

I should premise that the foregoing statements require some self-evident exceptions which not only test, but often prove the rule. I except traumatic strabismus (in which class I include strabismus, the result of operation), paralytic strabismus, most cases of alternating strabismus, and some anomalous cases that defy all rules of diagnosis and treatment. But even in these no operation is usually advisable.

The non-operative treatment of strabismus naturally divides itself into:

1. Prophylaxis.
2. The treatment of ametropia.
3. The treatment of heterophoria.
4. The treatment of amblyopia.

5. The treatment of physiologically curable strabismus.
6. The treatment of alternating strabismus.
7. The treatment of anomalous cases.
8. The treatment of incurable cases.

1. THE PROPHYLAXIS OF STRABISMUS.

A. Public instruction should be given, in the many possible ways, that strabismus may be prevented, and in its earliest stages is curable without operation, but only on the condition that the child is put in charge of an oculist at a sufficiently early age. Parents, especially those with considerable ametropia or amblyopia, should be warned of the danger of the probable inheritance of ocular conditions in their children which may lead to strabismus. The eyes of all children from the age of one year should be periodically examined by the expert, in order to detect at the very earliest possible age any conditions which if neglected may lead to strabismus.

B. The individual child should be taken in hand by the oculist at the very earliest day when heterophoria, temporary, or acute strabismus is diagnosed.

2. THE TREATMENT OF AMETROPIA.

This primarily consists, of course, in getting proper glasses on the child as soon as it may safely wear them. It may not be necessary or advisable at this time to demand that they be worn all the time, but only at stated periods. The age at which spectacles will be accepted is much earlier than is supposed. If they are correctly prescribed, made, and worn, and if they are needed, a child of two years will soon cry for them, or cry without them, so pleasant is the result of their use to the shaping nervous system struggling to establish binocular vision. In the child under six years the sole successful method of diagnosing the ametropia is by means of retinoscopy. That there is probably not an "ophthalmic surgeon" in all Europe who can use this method with accuracy shows how far we are as a profession from knowing our science, practicing our art, or doing our duty. Upon the accurate diagnosis of the hyperopia, myopia, astigmatism, and anisometropia depends the entire success of the non-operative treatment of strabismus, and this diagnosis in young children can not be made without retinoscopy.

What the prescription shall be after the diagnosis of

the static refraction has been made, will test the oculist's skill and judgment to the utmost. Every obstacle should be eliminated, every inducement made to the weak, injured, struggling efforts of the ocular mechanism toward binocular vision.

Mr. Priestley Smith in his Bowman lectures gives the "refraction" in 310 cases of convergent strabismus as follows:

		No. cases.	Per cent.
M.		3	1
E. to H.	1.5 D.	34	11
H.	2. to 3.5 D.	106	34
H.	4. to 5.5 D.	122	39
H.	6. D. and over.	45	15

} 88

Measured, of course, by the ophthalmoscope! Thus it is confessed that inadvertently the two great, almost the sole causes of strabismus, astigmatism and anisometropia, are utterly ignored!

It is said that the influence of hyperopia has been overestimated as a cause of strabismus; that hyperopia prevails also in non-squinting children; that the vast majority of the non-strabismic have hyperopia; that many emmetropes have strabismus, etc. The overestimation of hyperopia as a cause of strabismus is likely to be made by those only who have not learned the art and necessity of retinoscopy, and who have not suspected that the great chief causes of heterophoria and strabismus are anisometropia and astigmatism. That hyperopia exist in the orthophoric, and that the vast majority of the non-strabismic are hyperopic has nothing to do with the matter, as these statements ignore the true causes of strabismus, and the infinitely varying degrees of resistance to morbid stimuli. Everybody has repeatedly disobeyed the laws of hygiene in diet, and yet but few have dyspepsia. There are tuberculosis bacilli in all our lungs, but most of us have not tuberculosis. As to emmetropia in heterophoria and strabismus, I have never seen a case, and I do not believe such a case has ever existed.

3. THE TREATMENT OF HETEROPHORIA.³

I have little to add or change in the paper I had the honor to read before you last year, so that repetition of its conclusions seems scarcely necessary. I am still convinced that no operation is necessary in the treatment of these cases. I do not deny that others have had good

3. Heterophoria of high degree is not only potential, but, when the eye is at rest, actual heterotropia; therefore, we must describe such cases as exophoria-exotropia, hyperphoria-hypertropia, etc.

results from operation, but I have never seen any such results, and one of the many bad results that I have seen seem to me to outweigh a large number of the possible good ones. I have never had a case of exophoria that was not curable or in which all symptoms were not relieved by thorough-going prism-gymnastics. I have had many cases of exophoria running as high as from 20 degrees to 30 degrees (which means exotropia when the internal recti are not intensely innervated), reduced by gymnastics to normal balance, or if not entirely orthophoric, given an adduction power equal to all demands. Sometimes the exophoria has been combined with hypertropia, the latter condition disappearing with cure of the exophoria. Case 5701 was also complicated by incurable Bright's disease, and yet a hypertropia of 8 degrees and exophoria of 7 degrees both disappeared under the exercises. It also happens that high degrees of exophoria-exotropia, or the reverse, require no treatment, or the patients will submit to none. Case 3484 has 18 degrees of exophoria and not a particle of resultant discomfort. I have a patient, a literary worker, with 20 degrees of esophoria, without a symptom of ocular or reflex trouble. Case 1925 has a hypertropia of over 12 degrees, due to chronic lead poisoning, and although he has 20/20 each eye he has not a symptom of which he complains. Case 4191 has 7 degrees exophoria and no symptoms so long as her ametropic glasses are worn. But she has 120 degrees of cultivated adduction power. Case 4617 had an esophoria-esotropia of about 18 degrees which it took 2 years of gymnastic training to reduce to normality, i. e., to esophoria of 2 degrees or 3 degrees. It is unnecessary to add that in a considerable number of cases by correction of ametropia alone, the heterophoria disappears in time, providing the correction is such as to help nature in her spontaneous normalization of equilibrium. Case 3535, for instance, had 15 degrees of esophoria, which in 4 years became normal. In hyperphoria-hypertropia, partial correction, reduced as normality is approached, is required to be added to the ametropic correction. Case 3681 had 15 degrees of hypertropia, and for years avoided operation at the cost of intense suffering. Correction of his ametropia and 6 degrees prisms fused in his lenses, gave him absolute relief.

4. THE TREATMENT OF AMBLYOPIA.

So far as essentials go I also have nothing of impor-

tance to add to a paper⁴ on "Amblyopiatrics," read before the Philadelphia County Medical Society ten years ago. As the reprint of this paper is out of print, and as many may not have noticed this paper or not have it at hand, I herewith reproduce selections from it:

That no name exists for the therapeutics of amblyopia in the cases in which the defect is ascribed to "disuse," leads to the astonishing fact that the desire or the attempt to cure amblyopia does not exist on the part of ophthalmologists. If a child with one weak and deformed leg is brought to the orthopedic surgeon, he does not say, "Oh, well, the child has one good leg, let it go on with that alone." If a finger or hand is injured, does a surgeon ignore its needs and congratulate himself and the patient that the rest of the fingers or the hand is all right? But it is a literal truth that an argamblyopic eye (i. e., one amblyopic from disuse), brought to the oculist is dismissed without care and without attempt at cure. In no text-book with which I am acquainted are either principles or rules laid down to govern the treatment, and no hint is given that any treatment is desirable. Not only so, but positive instructions are laid down that, carried out, prevent the weakened eye from ever regaining its lost power. It is as if the surgeon should say of a lame leg: "Strap it up out of the way; it can't work with the other, or as well as the other; let it go." Listen to this extract from the latest text-book on ophthalmology, fresh from the press.

"IN ANISOMETROPIA WE GIVE THE SAME GLASSES FOR BOTH EYES, OR CORRECT ONLY ONE EYE AND PLACE A PLANE GLASS BEFORE THE OTHER.—FUCHS, TEXT-BOOK ON OPHTHALMOLOGY."

I set this sentence out in capital letters, as displaying as much ophthalmologic error and therapeutic sin as could easily be gathered into so many words. Another popular treatise puts it in this way: "For the class of patients whose ocular discrepancies (anisometropia) are so great that they always use only one eye, nothing is to be done save to aid as perfectly as possible the working member in case it needs assistance. The other is to be left to purely ornamental functions."

Any number of such quotations could be added were it necessary to show that the established conviction and practice of the ophthalmologic profession is not only to completely ignore the need and the duty of treatment of argamblyopia, but even to so further handicap eyes thus afflicted by measures of anti-therapeutics as to render recovery impossible, and even to increase the defect.

In square and absolute opposition to this I contend that

4. Published in the Medical News, Dec. 31, 1892.

every amblyopic eye is a sick eye, and that it is a physician's first duty to cure, whether it be eyes, or legs, or bodies.

Our impotent willingness to permit such a lazy method of non-treatment is a distinct reproach and discredit to us. It is simply untrue that patients with anisometropia will permit a proper and helpful correction of each eye. In some 2500 cases occurring in private practice I have found none such except two or three who have simple myopia in one eye and approximate emmetropia in the other. But for obvious reasons, in such cases there is no amblyopia, and they are, therefore, out of the count. Of course, correction of anisometropia may be inconvenient and even uncomfortable to the patient for a short time, but could one expect the abnormal habits and weakened organs of a lifetime to resume normality in a few days? Do orthopedic surgeons thus treat the consequences of spinal curvature or talipes? Instead of the supine let-alone policy we should seek to save and to heal and to strengthen. Instead of non-response to treatment and inability of the patient to wear binocular correcting glasses, I have, in fact, been delighted and astonished to witness how soon response comes and how short or non-existent is the period of discomfort. The weakened, almost blinded eye, soon reacts to the spur of kind, intelligent helpfulness, and, as month by month, one watches these eyes improve and gather strength, one feels the pride and pleasure of the true physician in his true work. I have never failed to find such reaction even in the most hopeless cases of argamblyopia.

There is a very suggestive illumination thrown back upon the question of etiology by the practical results of intelligent and persistent therapeutics. When large numbers of amblyopic eyes recover their lost acuteness of vision by means that permit and necessitate their functionalization, the dogmatism of authorities and the negligence of oculists receive a suggestive comment amounting to refutation, both of the theory and of the sadly common resultant practice, that the amblyopia is cerebral or that it is the causal agent of the muscular or ametropic anomaly. Almost without exception, my cases teach me that amblyopia is argamblyopia. (It goes without saying, of course, that amblyopia due to fundus-lesions and media-lesions are out of the count.) And when such improvement of vision follows the removal of the ametropic or heterophoric hindrance it, *ipso facto*, justifies the acceptance of the theory of effect-amblyopia implicit in the word coined.

But whether the one theory or the other be the true one, the therapeutic sin of not attempting to bring back the lost power of these handicapped and half-ruined eyes, is a sin that cries out against us. The number of persons going about, and going on to the age of cataract-possibility, with such eyes, is surprisingly large. Whether with growing practice one sees

more patients, or whether such argamblyopic patients, neglected by others, drift into one's hands, one is amazed at the frequency of the fact, and that instead of heroic effort to save, there has usually been pursued a no-policy of the most atrocious and let-alone indifference. Now, this policy of *laissezaller* is to me incomprehensible, unethical, anti-medical, and impolitic, and the object of this writing is to protest against it, and to offer proofs that it is in all these ways wrong. "Far from telling me how to save the bad eye, my doctor never suggested that it could or need be saved"—that gives the hint of the impolitic policy. "I now have cataract in my best eye, and the other has been no good for many years"—that should deeply sting the heart of the negligent physician—if he could hear it.

The practice may partially be a conscious or unconscious result of what I believe the false teaching that the amblyopia is cerebral or idiopathic, or is the cause of the co-existent strabismus or insufficiency, or again, of the still more execrable teaching to correct the ametropic defect of one anisometropic eye, leaving the other to go to the dogs.

The functionalization of argamblyopic eyes consists, of course, in three things: 1, the correction of the ametropia; 2, the reinstatement of the muscular balance, if imbalance exists; 3, exercise.

As to the correction of ametropia, there are a number of peculiar difficulties and problems. These each refractionist will overcome and answer according to his teaching, his habits, or his intelligence. Assuredly, no hard-and-fast rule will suffice, nor can such a rule be even approximately formulated. Each case will be a study in itself, requiring the most accurate discrimination of judgment, and the finest delicacy of testing. In an eye of which the neurologic elements and the cerebral centers are certainly weakened and partially atrophied, the failure to hit exactly the right kind, degree, or precise proportion of help required, foredooms at once to failure. The very breath of life in such an eye is trembling between endeavor and renunciation. A shade of over-correction or of under-correction, a slightly misplaced axis of astigmatism, a misplaced or maladjusted spectacle, a touch at the wrong place, the lack of a wee bit of help at the right place—anything except the right thing—smothers the little remaining power of recuperation, and proves a tiny load too great for the tiny forces to lift. We are dealing with infinitesimals, and the keenest and swiftest perception will win where a less subtle discrimination will fail.

It is evident that such eyes must be nursed and encouraged, as it were, into convalescence. Frequent re-testings will be required; frequent adaptations to the changed conditions sure to follow; watchful care if one weak part of the complex sys-

tem fails to respond or temporarily gives way; constant re-adjustment of the spectacles following and stimulating the renascent powers; and meeting them with the precise modicum of lessened or increased aid—these, and many such methods of guiding and guarding, must be kept in mind until full health is restored, and the convalescent eye enjoys and shares the labors of its fellow.

In the same way the reestablishment of muscular coördination, still further complicating the problem, will be brought about according to the peculiarities both of the case and of the physician.

But these questions having been settled, gymnastics will remain as the very heart of the matter and crux of the difficulty. An eye the visual power of which has from disuse fallen to 20/100, let us say, and reduced to only the temporary holding of the image of Jaeger 14 or 18, will not participate in binocular vision, however perfect the image formed on the retina, or however balanced the muscles. It must be exercised and gently forced to function. It is clear that the good eye must be temporarily thrown out of use, and the weakened brother put to work alone. The kind and the amount of exercise will again depend on the retained visual acuteness of the eye to read print, large or small, and the retained power to continue this for a longer or a shorter period of time. Here again appears the necessity on the part of the physician of careful estimation by a trained judgment to give the proper instructions.

But the final success will depend upon the patient's persistence, patience and coöperation. This coöperation will only be certainly gained by making him (or, if a child, his parents) thoroughly understand just what is desired, and the full significance of it all. To him it should be explained in detail and fulness, that exercise only develops function; that as years go by, non-exercise will still further and hopelessly ruin the eye; and that as age approaches, the possibilities of danger to the good eye (always doubled if there be but one) are greatly increased by the liability of cataract, of inflammation, of injury, etc.

The method of monocular gymnastics in these cases will depend upon the interest of the patient, the age, occupation, etc. In children too small to wear glasses, or to wear the blinder willingly, I keep the good eye under continuous mydriasis for weeks, or even for a month or two. I have, during the past year or two, ordered the patient to get a disc of black rubber fitted with a hock, so that it may be hung on the spectacle-lens in front of the good (unclosed) eye. Such discs are supplied by my opticians, who have prepared them in accordance with my request. The patient is to read print of a size that can be easily distinguished, and only

so long as signs of positive discomfort or weakness do not appear. Some patients can at first hold the image for but a few seconds. The shorter the necessary duration of such periods the more frequently they should be undertaken. Some patients can read or work with the single eye for an hour or two without trouble. The plan that has proved of most service, and has been productive of the best results, is to use the "blinder" when eating the meals. If living at home, the extra blinder is left at the plate as a reminder, and the practice is excused by friends. It gives an hour or more daily of varied and easy exercise without loss of time or the annoyance of special attention to the matter. I have a patient, a jeweler, who works at his bench with his blinder, in all one or two hours a day, and whose power and vision have been greatly improved thereby.

A certain proportion of cases do not report; a few get tired, or are indifferent to the matter. The following cases illustrative of the method and of its results may be cited:

CASE 1.—Mrs. H., 19 years of age, has had severe and continuous headache from early childhood, with gastric trouble, malnutrition, etc. Natural vision is R. 20/20; L. 10/200. Mydriatic refraction =

R.—sph. 0.25 \ominus + cyl. 0.50 ax. 90° = 20/20+.

L. + sph. 2.50 \ominus — cyl. 5.50 ax. 180° = 20/40.

With muscular balance.

After the return of the accommodation, and with the proper correcting glass, the left eye could read only Jaeger 14 at 12 inches.

Monocular exercise was ordered. In three months all headache had disappeared, the distant vision of the left eye, both at near and distant range, equaling that of the right eye.

CASE 2.—Miss M., aged 20, had the following defect:

R. + sph. 0.75 \ominus + cyl. 0.75 ax. 1.25° = 20/50.

L. + sph. 0.50 \ominus + cyl. 3.50 ax. 1.15° = 20/100.

Careful instruction as to ocular gymnastics has improved the vision in four months to R. 20/20; L. 20/50+.

CASE 3.—Mrs. R., aged 51, had the following refractive error:

R. 20/30 + sph. 0.37 = 20/20.

L. 10/200 + sph. 3.00 \ominus + cyl. 1.00 ax. 90° = 20/200.

With the left eye the patient could read only the large-print "Scripture leaflets" hung in rooms—the only thing I could get for her of sufficiently large-sized letters with which to exercise the eye. One year later, after more or less exercise of this eye alone, she was able to read Jaeger 12, slowly.

CASE 4.—Miss R., aged 25, under homatropin was found to have the following error of refraction:

R.—sph. 3.00 \ominus — cyl. 1.50 ax. 150° = 20/70+.

L.—sph. 7.00 \ominus — cyl. 0.50 ax. 180° = 20/70.

Eight months later the vision was: R. 20/20; L. 20/40.

CASE 5.—Mrs. K., aged 45, had 20/40 vision in the right eye, with a compound myopic astigmatism twice as great in this eye as in the left. There were 6 degrees of exophoria. Proper correction of all ametropia and insufficiency with monocular exercise relieved the life-long sick-headache, etc., and in 5 months the vision of the left was brought to the normal.

CASE 6.—Miss S., 35 years of age, had had frontal headaches all her life, and, with much near-work ptosis of the left lid. Refraction was:

R.—sph. 1.50 \ominus + cyl. 5.00 ax. $105^\circ = 20/70$.

L. + sph. 1.25 ax. $80^\circ = 20/20$.

Five months later, after the monocular course of gymnastics, all headaches and ptosis had disappeared, and the vision of the right eye was 20/20.

CASE 7.—Mr. P., 25 years of age, was found to have the following refraction:

R.—sph. 0.25 \ominus + cyl. 1.00 ax. $125^\circ = 20/20$.

L. + sph. 0.75 \ominus + cyl. 3.00 ax. $180^\circ = 20/70$.

He has been wearing a plane glass. After mydriasis had passed off he could, with proper correction, barely read with the defective eye Jaeger 10. Three months later he read Jaeger 4, with ease.

CASE 8.—Miss M., 46 years of age, gave a history of a lifetime of sick-headaches, once or twice a week with anorexia, anemia, etc. She was wearing:

R.—sph. 3.00 \ominus — cyl. 2.25 ax. 180° .

L. + sph. 0.75.

This had been given her for constant use, although her age was 46, and she was employed at writing all day. I found that her refraction was:

R.—sph. 2.50 \ominus — cyl. 5.00 ax. $165^\circ = 20/70$.

L. + sph. 0.37 = 20/20.

Hyperphoria of 3° .

A few months after correcting the ametropia, presbyopia, and hyperphoria, with monocular exercise of the right, the vision in that eye had improved to 20/40, and all the reflex symptoms mentioned had disappeared.

CASE 9.—A little girl of 9 was greatly afflicted with night-terrors, somnambulism, headache, anorexia, nervousness, etc. Her refraction was as follows:

R. + sph. 0.75 \ominus + cyl. 5.00 ax. $100^\circ = 20/70$.

L. + sph. 1.00 \ominus + cyl. 5.00 ax. $85^\circ = 20/100$.

The blinder was ordered for the right eye, with daily exercise of the left alone in reading large print toy-books, in playing, etc. The right eye soon recovered a normal acuity, but it took nearly a year of watchful care and exercise to bring the eye to 20/20.

CASE 10.—Mrs. A. has had constant frontal headache for the past 5 years, culminating in paroxysms of sick-headache every few days. When a girl at school she had "numb spells," etc. I found:

R.+sph. 3.50 \bigcirc +cyl. 1.00° ax. 150°=20/100.

L.+sph. 1.00 \bigcirc +cyl. 0.75° ax. 150°=20/20.

Persistent exercise with the blinder brought progressive increase of visual acuteness and power. The reading ability descended through all the sizes of letters from Jaeger 18 to Jaeger 8, and from ability to hold the image for only a few seconds, until now, seven months since beginning, she can read ordinary print with the right eye for a half-hour, and distant vision at the last visit was 20/70, with improvement still in progress. The headache, anorexia, ill-health, etc., have entirely disappeared.

CASE 11.—A girl of 10 years of age, anemic, with ocular and forehead-pain, was refracted on April 16, 1902:

R. 20/70+sph. 1.00 \bigcirc +cyl. 0.25 ax. 90°=20/30.

L. 20/200+sph. 1.25 \bigcirc +cyl. 0.37 ax. 90°=20/70.

With the prescribed exercise of the left eye, the vision in six months had reached 20/30, and will doubtless soon be equal to that of the other.

CASE 12.—A lad of 17, with a high degree of compound hyperopic astigmatism in the right, and 20/70 vision, while the left had perfect vision, and a low degree of the same refractive error. The blinder treatment has brought vision in the right eye to 20/20? in six months.

CASE 13.—This case is an instructive one. A gentleman of 46 years has had severe ocular trouble and headache all his life, but for the past 12 years these and other symptoms have been excessive, and he has reason, if he but knew it, to preach some useful lessons to ophthalmic specialists. One of these gentlemen, who prides himself on prescribing by ophthalmoscopic examination alone, fitted him with glasses 12 years ago, but with the most heroic endeavor he could not wear them. Vertigo was at this time, and for 6 years, so pronounced that it was a source of daily wretchedness. Then came the turn of the graduated tenotomist, but the vertigo was worse and mental confusion became so great that pronounced cerebral disease was diagnosed by physicians. He feared insanity, and was so haunted by suicidal mania that he had to take daily precautions to obviate the thought and the circumstances that might lead to its execution. This went on for years. A firm will has kept the upper hand through all these years. The patient describes his symptoms as "panic-feelings and palpitation of the brain," with extreme nervousness and nausea. The headache has been less of late. Lastly, a famous oculist told him to go to an optician and get whatever glasses should be given to him there. These he has been wearing for reading—

what little he can do. They are simple plus spherical 3.00 D. lenses, the same for each eye! After hours of careful work I find his true refraction to be:

R.+sph. 2.00 \bigcirc +cyl. 2.00 ax. 40°=20/40.

L.+sph. 1.50 \bigcirc +cyl. 1.00 ax. 90°=20/30+.

With the right eye alone he can hold an image of Jaeger 10 but a second or two, the letters then "jump" and fade.

When one thinks of a lifetime during which the poor eyes and the cerebral centers of the last case, for example, have struggled and begged for a bit of intelligent help; when one analyzes the peculiar defect that would not let either eye renounce vision; when one considers the fact that a strong healthy masculine will has fought against this frightful evil, and preserved its defective mechanism so well; or what would have been the result in a woman—when one ponders over these and many such related things, one is pained with sympathy, and indignant at the failure to help.

The age of the patient, of course, has a great deal to do with the success of treatment in all these cases, and one fact stands out with clearness; the younger the age at which the treatment is begun the better. Reaction is prompt in the young, and every added year of failure, and wrench, and wreck, makes the task ever more difficult.

I have had something like fifty of these cases, and many had previously passed through the hands of others unbenefited. It would, therefore, appear that the duty to "fight for a bad eye" is at present not at all recognized. Every such case is pathetic with dumb pleading for a simple bit of help that it should be at once our highest duty and privilege to give. Moreover, to prevent disease is even greater than to cure it, and if taken early in life in no branch of medicine is intelligent prevention of intolerable evil so possible and so beautifully resultful as in painstaking and skilled refraction-work.

To the foregoing suggestions I might add that in my practice I have not found it necessary or to any considerable extent helpful to add the use of stereoscopes, the reflecting stereoscope, the amblyoscope or the heteroscope,⁵ bar reading, the fusion tubes of Priestley Smith, etc. The stereoscope may be of temporary use in some cases. Some of these contrivances I have not even tried.

5. For the formation of such barbarisms as these two words the etymologic criminal should have a unique punishment, and in this present world! An ophthalmoscope is an instrument with which to view the eye. An *amblyoscope* can mean nothing else than an instrument for viewing a dull or blunt (thing).—The father of the word may have meant an instrument for viewing amblyopia or dulled vision. How would it look? The *heteroscope*, of course, means an instrument for viewing another or different (thing). Some one should invent a *psychoamblyoscope*, an instrument for observing psychic amblyopia.

The reflecting stereoscope of Worth is the most promising and I judge may be of great service in some cases. Most of them, however, are unnecessary when errors of refraction are accurately corrected, and when the thorough-going methods suggested are carried out with real seriousness, patience and insistence. I do not use the pad or bandage, as the sound eye should be kept open; a silk or velvet blinder is advisable attached to the spectacle lens or frame, of an extent sufficient to prevent vision with the covered eye.

5. THE TREATMENT OF PHYSIOLOGICALLY CURABLE STRABISMUS.

This treatment is by means of prophylaxis, by correction of the ametropia that prevents binocular vision, by reinstating the normal coördinating innervation of the muscles and by the treatment of amblyopia. The crux of the matter is in the decision as to the cases which are curable by nonoperative methods, and those in which operation must be performed. The fatal desire to get to work at tendon-tinkering leads to such horrible expressions as these: "After a trial by glasses we must, if unsuccessful by this method, advise operation." "Non-operative treatment may be persisted in for a month, or even two months." "In a small proportion of cases cure may be brought about without operation." Instead of which I would advise that several years be tried, a dozen or a score perhaps. Even the mutilations and deformities produced by tenotomania may be corrected in time by sane medical methods.

6. THE TREATMENT OF ALTERNATING STRABISMUS.

When taken early enough in life alternating strabismus may be cured by the methods described, but there are varieties of the affection which it is not very desirable to cure, especially if the habit is chronic. Many cases of alternating strabismus have binocular vision, but it is not synchronous. I remember, for instance, a few such cases in adults, with simple myopia in one eye and approximate emmetropia or simple hyperopia in the other, the myopic eye, of course, used alone for near, the hyperopic having lost accommodation and used only for distance. As 99 per cent. of cases are astigmatic, it is extremely rare to find that no glasses are required, and, moreover, presbyopia will surely demand them later. In other cases although not anisometropic and

without the power of synchronous fusion the mind has caught the trick of psychic suppression of one image and preserved the acuity of both eyes with only slight and not deforming strabismus by alternation of fixation. No operation would have any good effect.

7. THE TREATMENT OF ANOMALOUS CASES.

Despite our rich nomenclature there are cases that are not accurately or fully nameable or describable, except individually. Dr. Charles Herman Thomas⁶ describes three cases of strabismus with anomalous diplopia, caused by an original and acquired fixation spot in each eye, the normal macula being used in monocular fixation, the other in binocular fixation. I have had similar cases, one in particular, in which choroiditis had destroyed the macular region in one eye and a new macula produced a pseudostrabismus. In another two new maculas had been formed, and there was great increase of visual acuity with two heavy prisms, bases up, which deflected the cones of light more accurately upon the two new maculas. I have noted among my cases a number of instances of what might be called intermittent strabismus, the strabismic eye becoming simply heterophoric for awhile and again becoming strabismic without apparent cause. These in chronic cases in adults seem to differ from those common in children, in which strabismus comes on only with great excitement, loss of health or great fatigue. Thus in Case 5552 the left eye has been convergent from about the age of about one year. At 9 I found each eye still retained 20/40 vision. For a year there was intermittent strabismus, but within one year there was recovery of 20/20 vision in each eye and constant binocular vision.

There is a puzzling class of cases which show divergent strabismus, or the convergent variety, with one set of tests but the reverse defect with another. The eye, e. g., is highly divergent under cover, but as highly convergent with the Maddox rod or prism diplopia. Case 6316, for example, had this anomaly. She could use both eyes together or either separately and at will. There were no symptoms.

Another class of most troublesome cases is characterized by strabismus only in certain positions of the head. In Case 6,605 the patient had nausea in looking down-

6. Am. Oph. Soc., 1894.

ward owing to paresis of the inferior rectus of one eye. There was hyperphoria of 5 degrees in looking at the book or sewing in the lap; 3° B.D.L. in the near lenses of her bifocals gave complete relief.

Among suggestive anomalies may be noticed the case of my friend, Dr. Pyle,⁷ in which a blunt hook had torn through the lower rectus of one eye, the conjunctiva, etc., of the entire structures beneath the eyeball from the inner to the outer canthus, part of the inferior rectus being found upon the hook after the accident. Perfect binocular motion and vision were finally reinstated. In another unreported case Dr. Pyle tells me that a patient continued to use prism-gymnastics for exophoria beyond orders, and when she returned her exophoria of 12 degrees had become esophoria of 20 degrees. This change of 32 degrees merely by adduction exercises will doubtless not be believed by the makers of surgical instruments. But it is well to curb the ambitions of these commercial gentlemen or otherwise they might be advocating new and wondrous tenotomes for rectifying an erratic motion of the earth by operation on the muscles of the solar system!

Cases have sometimes shown a positive strabismus of one kind upon one day which disappeared or was reversed at another time; others with perfect vision of both eyes and yet with a suppression of the image of the nonfixing strabismic eye. I have had at least one instance, Case 4,983, of what I have called "strabismus hemianopsia," i. e., the loss of function of one-half of the retina due to strabismus, with consequent displacement of the macula, which so accurately simulated hemianopsia of cerebral origin that without knowledge of the history the perimetric chart would be held as evidence of it. The hemianopsia disappeared by training in one year. Such cases as these teach us many lessons whether our therapeutics aid much or little. The treatment of these anomalous cases will, of course, depend on the unclassifiable conditions present plus the intelligence and conscience of the physician. No rules can be drawn. The formation of new maculas is itself an illustration of what nature will do and seek to do if we will but give her time and freedom from our impertinence, to work out her slow, wise and beautiful methods of repair.

7. JOURNAL A. M. A., March 9, 1901.

8. THE TREATMENT OF INCURABLE CASES.

Incurable cases are of three classes: 1, The paralytic, which are beyond the scope of these notes; 2, the chronic cases, due to the neglect of parents or of the "ophthalmic surgeon," the period of possible cure having passed and nature's long appeal for help ignored, with the result that the eye is ruined. A fairly accurate law in these cases is that the preserved remnants of vision and innervation will show signs of reaction and revivification to natural treatment so long as the eye may be straightened non-surgically. When the eye can be of no use nature will not seek to straighten it. Moreover, as a rule, she will not allow it to be straightened even by the best surgical means. My advice to such patients is to leave such an eye untouched. Usually, despite whatever advice may be given, the patient has fully and wisely determined not to risk operation for purely cosmetic reasons. Such an eye is a fitting memorial of professional neglect, which as a standing negative advertisement we should, indeed, seek to hide under a blinder.

3. The worst and most hopeless of incurable cases of strabismus are those which are the result of unsuccessful operation for heterophoria or strabismus. There are many such, most of them coming down from the past generation when unart for unart's sake was the rule, and the result too often being increased hideousness for the sake of deformity. Many of these wretched people must have been operated upon for heterophoria, because they have irritating diplopia, the result of unextinguished vision in the deviating eye. Those of the latter class may sometimes be helped or cured by nonsurgical methods, but their bitterness of heart usually makes them refuse all further offers of help. Surgery they will not listen to, and I have yet to see operation for the cure of the evil results of surgical operation do any good. It usually aggravates the evil, just as cure of heterophoria is vastly more difficult after there has been operation. As an instance, Case 6267 was operated upon for strabismus at 4 and again at 7. When the patient came to me some years later there was diplopia, headache, dizziness, etc. Fusion of the images was impossible. (The impossibility of fusion of the images when brought by testing closely to each other indicates that nature will never consent to their fusion. It is better in such cases to let them be wide

apart. The closer their approximation without fusion the greater the danger of accident to the patient.) By effort either eye could be used for near or for distance. The right was preferably used for near and the left for distant vision. Correction of refraction was the only therapeutic measure possible, but this gave great relief of the subjective symptoms. Case 4,077 had been operated upon for hyperphoria without correction of the astigmatism—a sin which the god of medicine will never forgive. The operation, as is so common, was successful at first, but there soon reappeared 10° of esophoria and 7° of hypertropia. Gymnastic training and partial correction of the hypertropia extinguished the lateral imbalance and reduced the vertical to 3° with binocular vision and satisfaction.

I do not deny that cases of strabismus have been “cured” by operation, nor do I deny that the vast majority of such operations are “successful.” I am unfortunate in that I have seen but one case—the eye, however, absolutely blind.

What could induce an observant man to suppose that partial cutting of the tendon of an ocular muscle would permanently lengthen it? Is it so even with a cord and suspended weight? Is there a scrap of evidence that cut from its attachment on the globe a tendon will grow upon a new unabraded, uninjured surface? The history of every case I have watched shows the slow but certain reattachment at the old insertion, and finally the same length and strength and tension as in the original condition. All healing processes demonstrate their aim to be to replace the old condition as near as possible after the traumatism, even to the regrowth of excised tissue. The immediate effect of the tenotomy has nothing to do with the matter. The sole question is, what is the condition a year afterward?

The fallacy as to “cure” and “success” usually lies in the choice of the time when these estimates are made. If immediately after the operation the words have no meaning. The patient must use his eyes in after years and all his life. If the cause of the strabismus was not in the lengths or strengths or insertions of the muscles, but if these lengths, strengths and insertions were the results of other causes, surgery was absurd and there was no cure. Hence, in a few months or a year all the old troubles return after needless surgical intervention.

Eight or ten years ago I also was in "Arcadia," the surgical Arcadia, where I undertook operation for heterophoria and strabismus. But I found that my awkwardness, or perhaps some other causes, soon made me sure that I was in another, a far warmer and a much less happy country. I supposed for years that my failures were due to my poor surgery, for I had heard all my Arcadian surgical brethren vowing they were most successful and happy. Then the results of their work began to appear in my office, and I again moved back into Arcadia. But it was an individual Arcadia, and for awhile I was very lonely. With the exception of the one case I have mentioned I have never seen the results of an operation in heterophoria or strabismus of which I should be proud to say, *I did it!* If there were any real and permanent effect, there was either immobility, the stare of remonstrance or of death, the proptosis or exophthalmos, the wobbling and lack of control, or the fixed strabismus—one or several of these symptoms combined—and these are things that make one turn attention to physiologic rather than surgical methods, to prevention rather than cure. As to treatment, when these patients do ask for help we dare promise them nothing, and we shall in the worse cases usually end by advising a ground glass lens that will as little as possible attract the attention of others and hide from view an unseeing or an unsightly eye.
