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IT is a reproach to the medical intelligence of to-day that a paper with this title should find a place on the program of a meeting of medical men. The truths which it presents (for they are truths, verified in a thousand instances) should be so familiar that any repetition of them should be unnecessary. The immediate and remote consequences of ametropia should be known to every physician. That they are not, is the reason of this paper; what they are, the results and the remedy, will be my endeavor to present. Ametropia simply means an eye with incorrect measurements. It means that such an eye, in the state of rest, does not bring parallel rays of light to a sharp focus on the retina. That is a little thing to cause trouble to its owner, too little in the opinion of many physicians to be regarded at all. Let us see what are the facts in the case and how intimate is the relationship of this simple thing to the health, happiness and habits of the individual. Let us take up seriatim the three grand divisions of ametropia, myopia, hyperopia and astigmatism.

It is interesting to note how opposite are the

effects of near- and far-sightedness upon the growing child. Myopia is a condition in which the far point of distinct vision is at a finite distance. Degrees so low as even a half diopter will mean for a child inability to participate in any of the out-door games. This means a deprivation of exercise in the open air, an ill-developed musculature and a disproportionate development of the brain at the expense of the body. Such children become solitary in their habits. In disposition they become morose. In school they are inattentive to blackboard work and are reproved for that which is no fault of theirs. All these have their marked influence on the growing mind and body, and character is altered therefrom. Hyperopia is the opposite of myopia, and produces opposite but no less marked results. In this condition parallel rays of light can be brought to a focus on the retina only by an effort of accommodation. In other words, distinct distant vision is secured only by constant muscular action and near vision only by a still greater effort. Children with this condition detest study, are thought to be indolent and can only be driven to close application. They delight in out-door games, are physically robust and ill-developed mentally. They are truants from school, and fall into bad habits. The criminal class finds many recruits from the hyperopes. It is not appreciated how irksome, if not impossible, becomes continued use of the eyes for near work; and such children are not infrequently punished for their infirmity.

It is little short of marvelous to note the change which properly fitted lenses work in both these cases. Children possess the same qualities the world over. They are eager to learn and they rejoice in out-door sports as well. With

corrected vision the myope takes his share of play with his fellows, the hyperope his share of school work without complaint, and that natural balance which should exist between brain and brawn ensues to the perfect development of a sound mind in a sound body. It is almost an axiom that a backward child is a defective, physically and not mentally. Sometimes it is his hearing, but more often his vision is at fault.

Civilization is making giant strides in progress and is daily making greater demands upon the accuracy of our faculties. Daily are the conditions for success becoming more difficult to meet, and it is not fair to the child that he should start handicapped in the race of life. School work, while it should not be, is graded for the highest intelligence. The defective lags behind and becomes discouraged. The State gives every year more and more attention to perfecting the courses of study which shall, in its judgment, best fit its students for their future lives and shall meet the demands which a progressive civilization is to entail upon them, *but* it does nothing to insure that the student shall be in the best possible condition to attain the results aimed at or to start out fully equipped with those faculties which shall render their attainment possible. There should be a State Board of Physical Examiners for the primary student, whose duties should be to inquire into the physical condition of such students, to suggest the remedy for defects and with power to compel its application. So long, however, as the State neglects this it devolves upon you and me to do missionary work along these lines. We should preach to every parent the need for the examination, under atropine, of the eyes of all children of school age. That there is need for

this is shown by statistics which demonstrate that 35 per cent. of all school children have defective vision to a degree sufficient to hamper them in their work. Were these children fitted with proper lenses we would hear less of inattention to study, of headaches and poor vision, and the average of health and attainment would become markedly higher.

In the foregoing nothing has been said of astigmatism because only the immediate consequences of ametropia have so far been dealt with. The immediate consequences of astigmatism, if of high degree, may be taken, for brevity's sake, to be identical with the other forms of ametropia. While this is not wholly true it is allowed to pass in order that the remote, reflex and damaging results of ametropia may be given their due consideration. In closing this phase of the subject permit me to quote from the report of Dr. Gulick, Physical Director of the New York Public Schools. He says: "However perfect may be the arrangements of the school building in lighting, heating and ventilation, the central difficulty of school life remains. It is a difficulty which is dependent upon the fact that the treasures of civilization are stored in print, in minute black marks upon a white surface which must be held relatively close to the eyes. This involves a constant attention and strain of the ocular apparatus to which it was not adapted during the long ages when it was being developed. Even under the most favorable conditions the strain of civilization rests most heavily upon the child with reference not merely to the eye but also to the nerve centers back of the eye and to that very great symptom-complex which is associated, as we have recently discovered, with eye strain."

Brief space will be given to the remote results of myopia and hyperopia. Whatever may be the cause of the former condition it is certain that its remote effects are expended on the eye itself, low forms of choroiditis result and vision is damaged. Incidentally it may be remarked that the best preventive of this disease is early and accurate correction of the refractive error. Of simple hyperopia it is also true that the eye suffers. If of high degree, sustained near work is impossible; if of low, only with advancing years does trouble come.

In considering the remote and reflex disturbances due to ametropia we should take into consideration two things. The first is that our bodily mechanism has given it a certain quantity of nerve-force to energize its various organs. If one draws too largely on this supply others must suffer, and the organ of least resistance will show disturbed function. The second is that every instant of our waking existence the eyes are in constant action, that such activity calls for nervous energy in large amount even when the eyes are normal, and if these eyes be the seat of hyperopia or astigmatism the drain of nerve-force is enormous and exhausting. Bearing these things in mind it is evident that it is only a question of time when the whole economy must suffer.

Cohen, in his "System of Physiologic Therapeutics," says: "As a causative factor in the production of headache eye strain is most important. Anorexia, dyspepsia, constipation, heartburn, nausea and repeated attacks of vomiting represent *some* of the gastric reflexes. Amenorrhoea, dysmenorrhoea, are menstrual anomalies sometimes caused by eye-strain. Insomnia, nightmare, chorea, nocturnal enuresis and even

epileptiform seizures have owed their existence and perpetuation to uncorrected eye-strain in some form." Every word of this is true and has been proved true in many instances, but it is not a strong enough statement nor is it sufficiently comprehensive. Any organ or the nervous system as a whole may suffer or may cause to ensue any of the protean disturbances, which for lack of causal recognition is termed neurasthenia.

What is the reason these patients are not cured? The answer is easy. Simply because the remedy is not applied. Patients with symptoms which may be referable to eye-strain are sent for examination. Vision is found to be better than the average, lenses of any kind blur vision, and the patient comes back with the report that the eyes are not at fault. Let me here interpolate just one illustration. A woman forty years old—note the age—came to me some years ago in a pitiable condition with symptoms referable to eye-strain. She had 20/XV vision in each eye and the weakest cylinder or spheric blurred vision. I told her that the eyes were not the cause of her troubles. She had more sense than her oculist, for she came back insisting on a second examination. Under cycloplegis her error was found to be an hyperopia of two diopters with a half diopter of astigmatism at axes 180 in both. Glasses on that basis were ordered. She had the satisfaction of being cured. I had the mortification of admitting my mistake.

Have any of you doubts about the evil effects of eye-strain? If you have, give yourself an artificial hyperopic astigmatism by putting before your own eyes a pair of weak minus cylinders. Wear them half a day. You will certainly lose

your doubts and probably your dinner. It should be set down as an axiom, that in proportion to the visual acuity are the disturbances due to eye-strain. It is the little astigmatic errors which cause trouble. The large ones cause poor vision, there can be no attainment of a sharp focus, the eye gives up the struggle and with no effort there can be no strain. For the same reason glasses which are not altogether right are altogether wrong. A patient with an astigmatic error of one diopter will suffer less with no correction than he will with an .87 or with a 1.12 cylinder.

This leads up to axiom number two, which is—nothing short of mathematically accurate correction of the ametropia will remedy the condition. Just two short illustrations of this: Patient number one got relief by changing the cylindric lens from a .75 to an .87; number two, by shifting the axis of a .62 cylinder five degrees. This seems like splitting hairs, and a few years ago I would have thought so too. I know better now. There are those who think they are doing refraction work who rely on the ophthalmometer and the correction of the manifest error without a mydriatic. I was taught this method and it took me ten years to unlearn it. I never now refract a patient under forty without full cycloplegis, often between forty and fifty, and sometimes even later in life. Knowing and having practised both methods, I am in a position to assert without fear of successful contradiction that the man does not live, who can with accuracy determine the refraction of an eye unless that eye is under full ciliary paralysis. This does not mean that this eye shall be given its full correction as so found, but that the static refraction, under cycloplegis, shall be the basis for the final prescription of glasses.

There are post-cycloplegic conditions which

modify the findings and problems which are difficult of solution and even of comprehension. One which I might mention and which passes my understanding is a static refraction, less under mydriasis than afterward, in other words, an eye which will take as a post-cycloplegic correction a stronger plus or a weaker minus spheric lens. The rule is the reverse of this. Again a cylinder under mydriasis may be best at 90° ; afterward its best axis may be 75. I think I know the reason for this, but its discussion here would be out of place.

To group the three axioms we have : first, the better the vision the more the reflex troubles; second, only absolutely correct refraction will cure the trouble; and third, no cycloplegis, no refraction. Let us not claim everything in sight, let us be ultra-conservative and admit that there are some headaches, some gastric disturbances and some obscure nervous disorders that may be due to eye-strain. Such are some of your cases. Look to it that instead of being leaders you are led. It is becoming a matter of common opinion, and the lay press is printing articles on eye-strain and its remote consequences. Some of your patients that you have been treating for nervous headaches, biliousness, hysteria, neurasthenia and such like occult disorders, are going without your knowledge or advice to the scientific refractionist and are finding that two little, oval, insignificant pieces of glass placed in front of the face cure the biliousness and headaches for which you have been drugging them for years. This does not inspire in them a calm acceptance of their years of suffering or add to your reputation. I am far from saying that all the ills that flesh is heir to are due to eye-strain. I think there are other possible causes of headache, but I do say that you

have not done your whole duty to your patients until every possible causal factor has been investigated. At least give them the benefit of the doubt. Put them under homatropine for a few days. If the symptoms are due to eye-strain you will get speedy relief. I have seen a headache disappear in the office while the drops were being used.

It is admitted that the treatment of functional disorders must be more or less symptomatic and in consequence more or less disappointing, but if there be, and there are, many and far-reaching effects from eye-strain, this etiological factor should receive its due consideration. If only a small percentage of the reflex neuroses be due to this cause you owe it to your patients that this source of trouble shall be eliminated before condemning them to symptomatic treatment which many times means nothing else than lifelong dieting and drugging with, at the end, partial or total invalidism. Again would I repeat, you can not cure a disease until you apply the remedy, and in this case the remedy is accurately fitting lenses. Don't send your patients to an oculist who returns them in fifteen minutes with a report that there is perfect vision and nothing wrong with the eyes. It takes hours to do the work properly. Many are the causes of failure, and many times it lies with the oculist himself. To do *good* refraction work requires so large a mixture of brains, patience and judgment that few men possess these qualities in sufficient degree to enable them to qualify for the work. There are many oculists, there are few refractionists. As for the "graduate optician," his work would be laughable were it not pitiful. *No one*, whatever may be his qualifications, can say, with even a fair degree of probability, what is the refrac-

tion of an eye without the use of atropine or some other cycloplegic. To work without it is simply to invite failure. Perfection is a matter of trifles but perfection is no trifle, and I assure you that nothing else will do in the matter of refraction work.

Do not think that I am carried away with the enthusiasm of the specialist. I did general practice for many years. Do not think either that I hold the patient's eye so close to my own that I obscure the whole medical horizon. I admit there may be other disorders besides eye-strain; but I do assert most positively and unequivocally that there is nothing which is so productive of gastric, nervous and cephalic disturbances, and that nothing can be surer than, when this is the cause, that only can it be removed by its one remedy—accurately fitted and adjusted glasses.

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