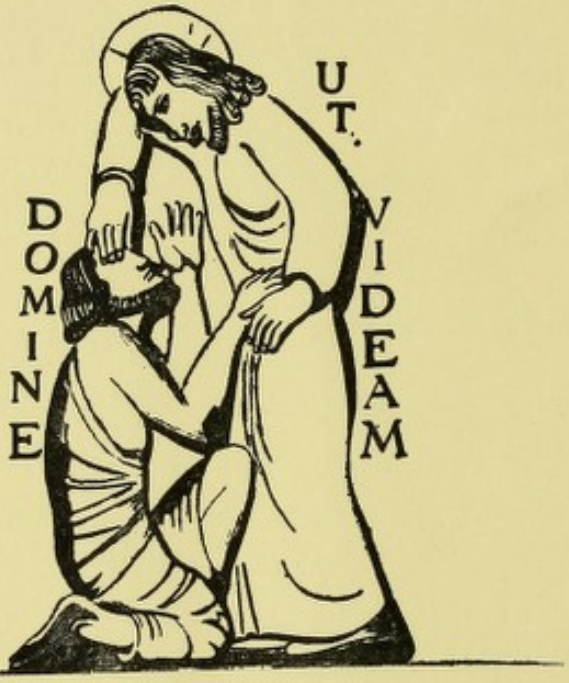
Eye strain in everyday practice / by Sydney Stephenson.

EYE-STRAIN IN EVERYDAY PRACTICE

SYDNEY STEPHENSON



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1914

EYE-STRAIN IN . . . EVERYDAY PRACTICE.

By
SYDNEY STEPHENSON,
M.B., C.M.Edin., D.O.Oxon.,
F.R.C.S.Edin., Ophthalmic
Surgeon to the Queen's Hospital for Children, London,
to King Edward's Memorial
Hospital, Ealing, W., &c.,
Editor of *The Ophthalmoscope.*

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PREFACE TO THE FIRST EDITION.

THE articles included in this little book have appeared at various times during the last ten years in the columns of the *Lancet*, the *British Medical Journal*, the *Medical Press and Circular*, the *Practitioner*, the *Birmingham Medical Review*, *The Ophthalmoscope*, and the *Reports of the Society for the Study of Disease in Children*. They include the Richard Middlemore Post-Graduate Lecture delivered by me in December, 1910, at the Birmingham and Midland Eye Hospital.

With increasing experience, I become more and more convinced of the influence of eye-strain in producing general reflex neuroses, and it seems to me to be important that the connection between the two things should be even more widely recognized by the medical profession than is at present the case. With this end in view, I have ventured to bring together a collection of communications, which,

although they lay no claim to originality of view or of treatment, may yet be of some slight service to one section of humanity.

SYDNEY STEPHENSON.

PREFACE TO THE SECOND EDITION.

A LARGE edition of this little work having been exhausted in the course of about a twelve-month, a second impression is now published. It contains nothing new.

SYDNEY STEPHENSON.

33, *Welbeck Street*,
London, W.,
February, 1914.

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EYE-STRAIN IN EVERYDAY PRACTICE.

I. On Eye-strain, or Asthenopia, and its Detection in Practice.

"EYE-STRAIN," a convenient modern expression, may be taken as meaning that the eyes cannot be used, as they should be in a state of health, without entailing a strain upon the muscles, intrinsic or extrinsic, of the eye, which in its turn betrays its presence by local or general discomfort. It is a matter of common knowledge that this strain is more likely to show itself among the cultivated than the non-cultivated members of society, so that the small error of refraction that would almost certainly pass without notice in an agricultural labourer might give rise to serious discomfort in a hard-worked literary man. For a similar reason symptoms are more likely to be met with in women and children than in men. Finally, the so-called "neuropathic temperament" is without doubt a most important

factor in determining the symptom-complex of eye-strain.

That many a chronic "headache" or "neuralgia" is due to eye-strain is nowadays admitted by everybody, although there need be neither pain nor discomfort in the eye itself. But when we come to a multitude of other functional disorders, chief among which are chorea and epilepsy, there is no such unanimity of opinion, even among those well qualified to judge. On the one hand, stand certain writers, in particular Dr. George M. Gould,[1] who would trace almost any and every affection of the nervous system to eye-strain, while others see in the relief of this or that symptom by weak glasses merely an evidence of suggestion and nothing more. Does not the truth, as usual, lie somewhere between these two schools of thought?

In reference to this point, some years ago Dr. Lucien Howe,[2] of Buffalo, N.Y., endeavoured to find out how often such conditions as tuberculosis, anorexia, denutrition, constipation, dyspepsia, chorea, epilepsy, insomnia, and so forth, were due to eye-strain. To that end he issued a comprehensive

[1] Gould, George M.: "Biographic Clinics." Philadelphia: P. Blakiston's Son and Co.

[2] Howe, Lucien: *Trans. Amer. Ophthal. Society*, 1905.

circular letter to 208 medical men, including in the number 162 members of the American Ophthalmological Society. One hundred and five replies were received, but of these thirty-four gave no figures whatever. Seventy-one reported (at least approximately) their total clinical experience, but of that number twenty-four alone sent complete replies of such a nature that they could properly form a part of a table of statistics. Dr. Howe estimated that the returns received from these twenty-four contributors covered some 350,000 cases in which eye-strain was a factor. Twenty of these observers had never seen a single case in which the unusual reflexes mentioned in the circular were due to eye-strain. On the other hand, four of the observers had noted, apparently as the result of eye-strain, the following conditions: chorea (one case), epilepsy (five cases), and insomnia (twelve cases).

In view of the foregoing figures, Dr. Howe was amply justified when he concluded: "This large experience shows beyond question that in the future it will be impossible for anyone to repeat the claim that these reflexes or conditions or any of a similar kind are considered by most American ophthalmologists to be the result of eye-strain. This is simply the assumption of a few enthusiasts."

The detection of eye-strain, even by the medical man, is by no means always the easy matter that it appears to be at first sight.

Matters are simplified if a patient complains of pain at the back of the eyes, or if the latter become red and watery and uncomfortable after use, or show such obvious signs of ill-health as redness of the edges of the eyelids or repeated styes.

It is most important to bear in mind that the sufferers seldom complain of any defect in vision. Indeed, nothing is commoner, when a suggestion is made that eye-strain may be the cause of their symptoms, than for them to remark, not without a touch of indignation, "My eyes cannot be at fault, as I have splendid sight." And so, in truth, they often have. But the question is: How do they obtain it—at the expense of a strain upon their eyes or otherwise? Every ophthalmic surgeon recognizes that, other things being equal, the tiny error of refraction, and not the larger one, is usually responsible for the symptoms of eye-strain. A patient affected with, say, a pronounced degree of hyperopic astigmia has never enjoyed good sight at a distance, and has learned by experience that by no effort can he obtain sharp images. Hence his complaint is not of "neuralgic headaches" or of

"brain-fag" and so forth, but of defective sight. His case is very different from that of a patient affected with a quarter of a diopter, or even less, of hyperopic astigmia, an amount that can be readily compensated by a continual and unequal contraction of the ciliary muscle. Such a patient may have sight that is actually better than normal, but in a neuropathic subject the strain involved may result in headache, eye-ache, "neuralgia," or the hundred and one ills that may be the outcome of eye-strain.

It must be borne in mind that the conditions of clear sight in such a patient imply a constant strain upon the ciliary muscle, which never gets a rest except when the patient is asleep. In an emmetrope, on the other hand, the eye is at rest when looking at distant objects, since the images are focused upon the retina without the intermediation of the muscle itself. To quote the graphic words of Dr. Leonard Williams: "The patient sees well, but in the majority of cases he does so at a cost which, physiologically speaking, he cannot afford to pay. He lives well up to the limit of his nervous income, and any slight unexpected attack will very readily project him into bankruptcy. It is when he has reached this state that he appeals to his doctor to be relieved of a headache or an attack of neuralgia"

("Minor Maladies and their Treatment," 1906, p. 139).

From what has been said it is clear, then, that the mere test of the relative visual acuity (in plain language, the "sight"), as carried out in the usual way with Snellen's distance types, has scant diagnostic value in these cases. In point of fact, the patient who reads the normal line when tested by those means is likely to be the very one whose general symptoms are in reality due to eye-strain, and it would be an error of judgment on the part of a practitioner to assure such a patient that his eyes were not at fault.

Again, there is the further consideration that myopic conditions, which impair the visual acuity to a relatively great extent, are not often the cause of eye-strain. Yet these are the very errors likely to be detected by the use of the Snellen types.

There is one condition in which the distance types will give us a valuable clue as to the nature of the underlying symptoms, to wit, when there is an inequality between the sight of the two eyes. It is well known that symptoms of discomfort are more likely to come on under those circumstances.

Somewhat similar considerations apply to the estimation of the muscular balance by

means of the Maddox compound rods, or in other ways, as by the so-called "cover-test." The primary difficulty here is to determine the normal. An imperfect muscular balance that would produce symptoms of discomfort in one individual may exist in another without producing any bad effect whatever. The personal factor is just as important here as in the case of refractive errors. Besides, these functional anomalies, conveniently grouped, as everybody knows, under the name "Heterophoria," are intimately bound up with errors of refraction; so much so, indeed, that to-day some good authorities maintain that muscular imbalance comes from errors of refraction, and that persistent wear of correcting glasses will ultimately dissipate all the symptoms.[1]

It seems clear, therefore, that in order to diagnose eye-strain something more is needed than the mere testing of sight by the Snellen types and the estimation of muscular balance by the Maddox rods.

A valuable clue is often afforded by the history. A patient sometimes volunteers the statement that his headache or what not is induced, or at all events made worse, by using his eyes, and contrariwise relieved by rest. A

[1] Hansell and Reber: "The Ocular Muscles," second edition. Philadelphia, 1912.

direct question will frequently bring out the same point. Especially characteristic are cases where patients complain that headaches are brought on by riding in the street cars or by visiting picture galleries or cinematograph shows, the so-called "panorama headache" of the Americans. Whenever a patient who is suffering from headache, "neuralgia," giddiness, loss of energy, insomnia, or so forth, makes such a statement, we should at all events be placed upon our guard and think first of the case being one of eye-strain.

Speaking generally, the pain due to overtaxed eyes is in the frontal region, often immediately over one orbit or both (Head). In an analysis of 428 cases of ocular headache made by Zimmerman,[1] the pain was frontal in 279 patients. Thence it tends, when severe, to radiate into the temples or, for that matter, to become general. The ocular headache is generally most marked, as might be expected, towards the close of the working day, although in a recent communication by Mr. Percy Flemming[2] stress is laid upon the diagnostic importance of a "morning headache." The patient wakes with the headache, which improves after

[1] Zimmerman, M. W.: *New York Medical Journal*, 1903.
[2] Flemming, Percy: *Clinical Journal*, May 17, 1911.

breakfast, and may be absent during the day if the eyes are not much used, but will be increased or brought about by using the eyes for near work. Mr. R. W. Doyne,[1] on the contrary, says: "It is very rare for ocular headache to persist after sleep, and the fact that it does so throws grave doubts upon the question whether the eyes are the cause of headache in that particular instance." Dr. James Hinshelwood,[2] again, states categorically that ocular headaches are generally absent in the mornings, an observation that agrees with my own experience. Under any circumstances, however, it would be unwise to lay much, if any, stress upon the question of "morning headache" as a diagnostic feature. It is, I think, going altogether too far to say, as Mr. Flemming does, that unless a headache is frontal or situated above each orbit and is present on awaking in the morning, "a surgeon should hesitate about correcting a half or quarter diopter of hypermetropia or astigmatism." A more rational attitude, as it seems to me, is that adopted by Dr. Leonard Williams in his useful book on "Minor Maladies and their Treatment" (1906). That accomplished physician writes: "Neither the

[1] Doyne, R. W.: *British Medical Journal*, August 13, 1910.

[2] Hinshelwood, James: *Lancet*, February 18, 1911.

distribution of the neuralgia (except that it is generally cranial) nor the type of the headache affords any indication that it is the eyes which are at fault, so that it is all the more important to keep constantly reminding ourselves of the now well-established fact that where either of these symptoms cannot be traced to any obvious cause, eye-strain is, in all probability, the main factor in their production" (p. 140).

It is unfortunate that by the very nature of things we are often precluded from adopting the most certain test at our disposal as to the ocular origin of this or that symptom, namely, by the application to the patient's eyes of a weak solution of atropine sulphate. By paralysing the ciliary muscle, that drug, of course, places the eyes temporarily at rest, and, if under its continued use a chronic headache or "neuralgia," or what not, disappears, we are justified in concluding that the symptom was due to eye-strain. It is unfortunate, again, that in myopia, where the remedy causes a minimum of discomfort, manifestations of eye-strain should be relatively uncommon, and that in hyperopia, where the manifestations of eye-strain are common, atropine gives rise to maximum discomfort. In that condition, when the eyes are under the influence of

atropine, reading becomes, of course, out of the question, while even distant sight is blurred in direct correspondence with the degree of error that exists. Still, I repeat that the most valuable and conclusive proof as to the ocular origin of a given symptom is to be found in the use of a solution of atropine for a few days. I may add that the strength of the solution need never exceed one grain of the sulphate salt to one ounce of sterile water.

When we come to the detection of an error of refraction that underlies a given case of eye-strain, too much stress can hardly be laid upon the fact that the error must be diagnosed and estimated with the eyes under the full influence of a cycloplegic, such as atropine, scopolamine, or homatropine. In these cases a mere approximation to the exact error is not enough, as it often is in hospital patients suffering from the grosser errors. If good is to accrue, the error must be worked out precisely, which, as a rule, can be done only by an ophthalmic surgeon, equipped with modern instruments, and endowed with the skill and provided with the time necessary to use them properly. The point is all-important. As Dr. James Hinshelwood[1] has remarked, another

[1] Hinshelwood, James: *Lancet*, February 18, 1911.

reason why eye-strain as a cause of symptoms is often overlooked is because the patient is already wearing glasses, and has derived little or no benefit from them. There are many sufferers from eye-strain going about to-day wearing glasses which fail to give them relief, or who, after a trial of such inefficient glasses, have become convinced that their symptoms are in nowise connected with their eyes. Yet, under a more careful system of examination, these patients could probably obtain relief.

The general teaching but a few years ago may be gathered by the following extract from a widely read and deservedly popular English text-book of ophthalmology,[1] the sixth edition of which was published in 1897: "It is not usually necessary to correct astigmatism of less than one diopter; but exceptions to this rule are not uncommon, some patients deriving marked benefit from the correction of lower grades." The days are now past when ophthalmic surgeons in this country disdained to correct anything less than one diopter of astigmatism unless sight were impaired. A conscientious practitioner nowadays is careful to detect and to correct the smallest amount he can find *when reflex neuroses are present;*

[1] Nettleship's "Diseases of the Eye," sixth edition, 1897, p. 328.

and he often has his reward in the relief obtained by his patients. Speaking for myself, some of my most gratifying results have been obtained where amounts as low as 0·25 or 0·12 D. of astigmatism have been neutralized by glasses. Another point that seems to me well-nigh essential to success in most cases of eye-strain is the constant use of the correcting-glasses. Patients should have the difference between "rest glasses," on the one hand, and "sight glasses" on the other, very clearly explained to them; and they will not then discard as useless a pair of glasses given for the relief of eye-strain, because at a distance they "can see better without than with them." To obtain the co-operation of the patient is to take a long step towards success in the treatment of the case.

II. On Ocular Headaches.[1]

No symptom, I suppose, falls so frequently under the notice of the medical man as headache, a remark that applies equally to the general practitioner and to the ophthalmic surgeon. It is often a matter of practical difficulty to trace a headache to its proper cause, although certain types are generally recognized.

Excluding cases where headache is merely an early symptom of some acute infective disorder, as typhoid fever, there are several well-defined groups, of which the following are perhaps the chief:—

(*a*) Many headaches, especially frontal ones, depend upon gastro-hepatic disturbances, and can be relieved or cured by attention to the alimentary canal, and, in particular, to the state of the bowels. The coated tongue, together with the history of constipation and gastric disturbance, generally suffice for the recognition of these toxic cases. That many headaches

[1] Based upon a paper read on January 9, 1903, before the Wimbledon and District Medical Society.

belong to this class is attested by the reputation attaching in the public mind to purgatives in the shape of patent pills, "beans," and so forth.

(*b*) Next, there is the important group of headaches, generally vertical or occipital in seat, bound up more or less intimately with anæmia. It is a familiar observation that the pain in such cases is often relieved by the recumbent posture, and cured by the administration of the preparations of iron.

(*c*) A similar kind of headache is common in cases of hysteria or neurasthenia, possibly because the last-named are so often accompanied by a reduction in the nutritive value of the blood. It often co-exists with that classical symptom, the *Clavus hystericus*, too well known to need description here.

(*d*) Another group is that furnished by patients who have been unfortunate enough to contract syphilis. The diagnosis in such cases is facilitated by the fact that the pain is usually most marked at night; that it frequently co-exists with the tenderness of the scalp; and that the patients, as a rule, show other signs of a specific taint, including a positive serum reaction. The syphilitic headache, moreover, is somewhat peculiar in that, although it remits from time to time, yet it never ceases altogether.

(*e*) Then the toxic headache, often due to the abuse of alcohol or tobacco, or to the retention in the system of waste products, as in uræmia, form a small but important class.

(*f*) Intra-cranial mischief, again, is generally associated with severe headaches of paroxysmal type. In such organic cases, however, other evidences of cerebral mischief will almost certainly be present, excepting perhaps in the earliest stages. The more important of these symptoms, as we all know, are projectile vomiting, giddiness, paralysis, retardation of the pulse-rate, and, above all, double optic papillitis, which (as especially insisted on by Dr. J. Hughlings Jackson) need not be accompanied by any defect in sight.

(*g*) Lastly, there is the important class where the headaches are distinctly of migrainous type —that is to say, beginning with ocular spectra, lasting for many hours or for several days, and associated with or terminating by vomiting. The victims generally belong to a good social class, and the affection (or the conditions which cause it) is markedly hereditary. Many headaches of this class, as I shall have occasion to show later, are intimately dependent upon *asthenopia* (eye-strain), and can be promptly relieved by the provision of suitable glasses.

If a given headache does not fall into one or

other of the foregoing groups, its exact diagnosis and correct treatment are likely to be matters of anxiety to the practitioner. Many of the unclassified headaches, however, belong to the group of so-called "ocular headaches"—that is, headaches which are induced or rendered worse by any attempt to use the eyes, particularly upon fine objects and under artificial light. How important this group is will be at once apparent from the bald statement that headaches of ocular origin have been estimated to form from 80 per cent. to 90 per cent. of all cases of cephalalgia (Sir T. Lauder Brunton).

Since the communications of Dr. S. Weir Mitchell[1] in 1874 and 1876 brought into prominence the various head symptoms caused by uncompensated eye-strain, a good deal of attention has been directed by some physicians to the eye as a cause for obscure headaches. About the same time as Dr. Mitchell's second paper was published, an extraordinary case was brought by Mr. R. Brudenell Carter[2] before the Clinical Society of London. An undergraduate, whilst reading for honours, was suddenly

[1] Mitchell, S. Weir: *Medical and Surgical Reporter*, July 25 and August 1, 1874; and *Amer. Journ. of the Medical Sciences*, 1876, p. 12.

[2] Carter, R. Brudenell: "A Practical Treatise on Diseases of the Eye," 1875, p. 564; and *Transactions of the Clinical Society of London*, vol. viii, 1875, p. 12.

attacked by a train of symptoms, such as headache, sickness, and palpitation of the heart, which were attributed to some obscure affection of the brain, a diagnosis confirmed by physicians both at the University and in London. The patient was sent on a voyage to Australia, but returned no better. He was then informed that he must give up all hope of succeeding to his father's business, and abandon a marriage engagement to which he was committed. His prospects in life were blighted. As Mr. Carter, in reporting the case, says, "his despondency was commensurate with his misfortunes." Now comes the curious part of the case. Mr. Carter found the patient to be short-sighted to the extent of 4·5 D., and after suitable spectacles had been prescribed all symptoms disappeared. It is most satisfactory to add that when last heard of, the patient was about to engage both in business and in matrimony.

Headaches due to the eyes are commoner than is generally thought. It is, indeed, such cases that help to fill the oculist's waiting-room, and such patients are among his most appreciative and grateful clients.

As in most instances the connection between the eyes and the head goes unrecognized by the patient, how are these headaches to be

known for what they really are? The question is not quite so easy to answer as might appear at first sight.

To begin with, the ocular origin of any headache should be suspected when it is stated that the pain, irrespective of its exact seat, is brought on by using the eyes, and relieved by rest. Thus, we are often told that on Sunday, when no strain is put upon the eyes, the pain is better or absent altogether, while it is practically constant during the remainder of the working week; or, again, that it is absent during the annual holiday. Under special circumstances the reverse may be the case, as in one of my patients—a busy banker six days a week and an ardent amateur artist on the seventh day—in whom headaches were experienced only on the Sunday.

Much the commonest site of pain is across the brow, and next to that is the temple. Vertical and general headaches, however, are by no means unknown. One may occasionally come across an occipital or nuchal headache due to eye-strain, and definitely relieved by glasses. The pain may present almost any degree of severity. It is apt to be described by patients as a "dull aching" or "boring" in the affected parts, and is not infrequently characterized as "neuralgic" in character. It

is usually bilateral, unless there be a marked difference in the refraction of the two eyes, when, in my experience, it is generally worse on the side of the better eye.

Apart from these considerations, the cardinal diagnostic point is that pain, whatever its exact site and nature, is brought on, or at all events rendered worse, by using the eyes. As a rule, it is near work that calls forth the headache, although in some patients, especially those who are affected with muscular imbalances, shopping, riding in a motor-car, or a visit to the theatre or the picture gallery is enough to bring it on.

I agree in thinking with most other ophthalmic surgeons that ocular headaches are usually more marked as the day goes on. But Mr. Percy Flemming[1] has recently insisted upon the fact that, in his opinion, such patients "wake up with the headache, which improves after breakfast, and may be absent during the day if the eyes are not much used, but will be increased or brought about by the use of the eyes for near work." In brief, he lays considerable stress upon this "morning headache" as a sign of its ocular origin.

It is most important to bear in mind that ocular headaches are not of necessity accom-

[1] Flemming, Percy: *Transactions of the Medical Society of London*, 1911, p. 129.

panied by pain or discomfort in the eye itself, a point particularly insisted upon by Dr. James Hinshelwood[1] in a recent communication on the subject. It is this, perhaps, more than anything else that misleads the patient into thinking that the eyes can have nothing to do with the causation of the headache from which he seeks relief.

Still, there are sometimes local signs of eye-strain to be found, and it is important that we should learn how to recognize them. The uncomfortable feelings of which patients most commonly complain are aching, tenderness, fatigue, throbbing, watering, or redness of the eyes. A frequent complaint is that lines of print become misty and cannot be read again until the eyes have been closed for a few seconds. A sign almost pathognomonic of eye-strain is the existence of slightly reddened eyelids, around the cilia of which is a collection of fine and branny scales, together with a tendency for the eyes to become red and watery after use. Whenever this condition is seen, one's thoughts should instinctively turn to eye-strain. An outbreak of small styes, also, is often a guide; and so is frequent blinking, with or without slight facial contortions,

[1] Hinshelwood, James: *Lancet*, February 18, 1911.

liable to be mistaken for chorea, but in reality, a reflex habit-spasm.

In a given case it may be easy or the reverse to elicit these various complaints. Children especially are apt to complain of a headache only, and to conceal or to disregard the associated symptoms. In passing, it may be said that in children a common complaint is of "colours" around the individual letters of which a printed page is made up.

It should be stated that chronic congestion of the conjunctiva, the objective signs of which may be very ill marked, is apt to give rise to a series of complaints closely resembling those induced by eye-strain. Thus, the eyes are stated to feel "sandy," and to be hot, burning and uncomfortable, symptoms all of which become worse towards night. Dr. Hanford McKee,[1] of Montreal, has directed particular attention to the frequency with which headache and other symptoms of asthenopia are associated with that chronic form of conjunctivitis due to the Morax-Axenfeld diplobacillus.

In headache due to eye-strain it is obvious that the severity of the symptoms will be the result of two main factors :—

(1) The general health and constitution of the patient ; and (2) the kind and degree of

[1] McKee, Hanford: *The Ophthalmoscope*, 1911, p. 182.

any refractive or muscular error of the eye that may exist.

(1) The General Health and Constitution of the Patient.

It is clear that an error of refraction, etc., is more likely to cause headache if the patient is in poor health, as from recent influenza, or debilitated, as from confinement or lactation. It is far from uncommon for the discomfort to make its appearance for the first time under such circumstances, even although the underlying ocular defect may have existed from childhood or even have been congenital. The explanation, of course, is simple. The general condition has involved the ciliary muscle, and so has rendered it unable to compensate without great effort hyperopia or hyperopic astigmatism. The converse also is to some extent true. The effects of eye-strain can often be relieved, for a time at all events, by the giving of tonics, the use of physostigmin or dionine to the eyes, and the leading of an outdoor and active life.

Then, complaints of headache are apt to be particularly pronounced in that numerous class of people who have inherited or acquired an unstable nervous system, perhaps as the result

of eye-strain, the "neuropathic disposition," as Dr. George T. Stevens[1] calls it.

Occupation, also, is not without considerable influence. Among clerks, typists, writers, and others who employ their eyes much on near work we find complaints of headaches to be particularly common. An ocular defect that would pass unperceived in a working man would be apt to cause distress in a highly cultured person.

In short, we should expect asthenopia to be marked under the following conditions and circumstances: (1) In patients who were recovering from some general illness; (2) in those of the neuropathic disposition; (3) in those of sedentary habits, who use their eyes on near work for long together; (4) in persons of good social standing and of more than ordinary education; and (5) in children and females.

(2) The Kind and Degree of Ametropia, &c.

The fact may be accepted as axiomatic that any kind of ametropia, whether it be hyperopia, myopia, or astigmia, may give rise

[1] Stevens, George T.: "Functional Nervous Diseases," New York, 1887.

to ocular headache. At the same time the liability varies much according to the particular kind of ametropia that may be present. My own experience in this matter coincides with that of other observers, namely, that of all errors of refraction, slight grades of hyperopia, with or without astigmatism, are the commonest factors in the causation of ocular headaches, or "neuralgias." The higher grades of hyperopia (say, anything over 4 D.) give rise to such defective sight that, except in quite young persons, they nearly always come under the attention of the ophthalmic surgeon sooner or later. But it is otherwise with the slightest degrees, where good vision for distant objects is obtained by the unconscious calling of the function of accommodation into play. As everybody knows, accommodation is in a state of abeyance in normal eyes when looking at objects 20 feet or more away. The emmetropic eye, in fact, is so constructed as to focus parallel rays, such as those from a distant object, upon the retina without the exercise of any accommodation whatever, whereas the hyperope must exercise to that end just as many dioptres of accommodation as he is hyperopic. This accounts for the fact that on testing patients with the slighter grades of hyperopia with the Snellen types, which are

adapted for a distance of 20 feet, normal acuity of vision ($\frac{6}{6}$) is frequently obtained. Hence, we must never fall into the error of thinking that the existence of normal vision excludes either hyperopia or hyperopic astigmia as a cause for obscure headaches.

The following examples may serve to emphasize this very important practical point :—

William W. ...	12 years	$\frac{6}{5}$ = better than normal	+ 2·75 D. spherical + 0·50 D. cylindrical at 60°
Jonathan K....	9 ,,	$\frac{6}{6}$ = normal	+ 1·0 D. sph. + 0·5 D. cyl. at 60°
Emily M. ...	12 ,,	$\frac{6}{5}$ ix = better than normal	+ 3·5 D. sph. + 0·5 D. cyl. at 150°
Ethel C. ...	10 ,,	$\frac{6}{5}$ = better than normal	+ 1·25 D. + 0·50 D. at 90°
Catherine S....	8 ,,	$\frac{6}{5}$ = better than normal	+ 1·0 D. sph. + 1·0 D. cyl. at 60°
Frank A. ...	10 ,,	$\frac{6}{5}$ = better than normal	+ 1·5 D. sph.
Joseph S. ...	8 ,,	$\frac{6}{5}$ = better than normal	+ 1·25 D. sph.
Charles P. ...	10 ,,	$\frac{6}{5}$ = better than normal	+ 2·0 D. sph.
William H. ...	9 ,,	$\frac{6}{5}$ = better than normal	+ 2·5 D. sph. + 0·5 D. cyl. at 90°
Wm. Jno. W	10½ ,,	$\frac{6}{5}$ = better than normal	+ 0·50 D. sph. + 1·0 D. cyl. at 90°
Alfred B. ...	7 ,,	$\frac{6}{5}$ = better than normal	+ 1·25 D. sph. + 0·50 D. cyl. at 90°

There would be no difficulty in multiplying instances of this kind, but enough has been adduced to point the plain moral, namely, never to exclude the possibility of a headache being due to hyperopia or hyperopic

astigmia because a patient's distant sight is found to be normal when tested on Snellen's types.

Neither does testing with the near types render much assistance in these cases, inasmuch as the smallest type will be read fluently by hyperopes of low grade, at all events until they have passed the age of forty years or thereabouts. Such cases must be tested with the ophthalmoscope and retinoscope under the influence of some agent that when dropped into the eyes is capable of temporarily paralysing the ciliary muscle, as atropine (in children) or homatropine (in adults). My own practice under such circumstances is to correct astigmatism completely, supposing the latter to be present.

As examples of headache caused by hyperopia or hyperopic astigmia and relieved by glasses, I quote the following cases, selected from a large number of which I have notes :—

When I first saw Miss B. G., aged 18, on October 30, 1905, she described herself as "a martyr to exceedingly severe headaches," which had commenced when she was a child at school. The pain was chiefly in the front of the head, and a day seldom passed without it coming on. It was induced by near work, and in particular by reading music

(the patient was reading for the Trinity College examination in music, "A.T.C.L."). In addition to the headache described above, this lady suffered about once a week from a much more severe headache, which compelled her to take to her bed, and which made her feel "frightfully weak." When she raised her head from the pillow, she became very giddy, and had to roll off her bed and then steady herself with something, as a chair or a chest of drawers, until such time as the vertigo passed away. After testing her eyes under a cycloplegic, the following glasses were prescribed for constant wear: R.E. + 0·25 D. cyl. axis 90°; L.E. + 0·5 D. cyl. axis 90°. I saw Miss B. G. again on March 7, 1910, when she informed me that during the three years she had worn her glasses for all purposes the headaches had completely disappeared. Then, thinking she was cured, she had used them only for near work, and during the last nine to twelve months there had been a slight recurrence of headache, which occurred once a month or so. The continual use of glasses speedily put an end to even these, and from what I have heard recently there has been no return of the headaches.

Mr. George A., aged 29. Headaches, described as violent, frontal, and occurring,

on the average, twice a week since he was 7 years of age. They were brought on by using his eyes on fine objects. The patient wore glasses (+ 1·75 D. sph.), which he had obtained from "a qualified optician." On examination, he was found to have 2 D. of hyperopia, together with the small amount of 0·25 D. of astigmatism, axis horizontal. After fully correcting this trifling amount of astigmatism, but otherwise leaving the spherical glass as the optician had given it, the patient was rid completely of his headaches.

Mr. Percy P., aged 21, a student of medicine, had suffered so severely from frontal headache and nausea that his parents had thought of putting him to some occupation less arduous than that of medicine. Treatment had been as varied as it had been unsatisfactory. Vision $\frac{6}{6}$ and No. 1 Jaeger. Orthophoria. Under a cycloplegic, the patient was found to be affected with slight hyperopic astigmia, with oblique and asymmetric meridians. He was ordered for constant wear:

R.E. $\frac{+ 0{\cdot}75 \text{ D. sph.}}{+ 0{\cdot}25 \text{ D. cyl. axis } 80°}$ L.E. $\frac{+ 0.75 \text{ D. sph.}}{+ 0{\cdot}25 \text{ D. cyl. axis } 110°}$

After using these glasses for two weeks he completely lost his headaches, and the same had not recurred the last time I saw the patient, three and a quarter years after he had obtained his spectacles.

Miss Alice B., aged 35, had been affected with headaches since she was 14 years of age. They were slight and infrequent at first, but became much worse and more frequent as she grew older. Latterly, they had occurred about four times a week, and since they usually lasted all day, they practically incapacitated her from work. They began, as a rule, with "specks floating before the eyes," and sometimes terminated with vomiting. They were described by the patient "as a throbbing and sharp pain all over the head." The eyes felt strained when reading small print by gas light. Medical treatment of the most varied kind had failed to afford relief. When I examined the patient on October 14, 1901, I found no latent muscular deviation; and after estimating the refraction under a cycloplegic, I prescribed for constant wear the following glasses: R.E. $\frac{+ 0{\cdot}65 \text{ D. sph.}}{+ 0{\cdot}75 \text{ D. cyl. axis } 180^\circ}$ L.E. $\frac{+ 0{\cdot}25 \text{ D. sph.}}{+ 0{\cdot}50 \text{ D. cyl. axis } 80^\circ}$ Miss B. was seen fourteen months after her eye-glasses had been obtained. She reported that during the period named she had not suffered from half a dozen headaches all told; that the pain in the head had been much less severe and had lasted for quite a short time; and that her eyes now never felt tired, no matter how much they were used. I tried in vain

to induce Miss B. to leave off her glasses, in order to see whether the headaches would return with their former violence.

Miss Jane C., aged 22, reported that for six months she had experienced "a pulling at the back of the eyes," and that since childhood she had been subject to severe headaches two or three days a week. The pain was mainly in the frontal region, especially over the left eye, which under those circumstances was stated to run with water. When examined on November 30, 1899, she could read the smallest type, and her distant sight was greater than normal (V. = $\frac{6}{5}$). Under a cycloplegic, the refraction was estimated, and the following glasses were prescribed for constant wear:

R.E. $\frac{+ 1{\cdot}75 \text{ D. sph.}}{+ 0{\cdot}50 \text{ D. cyl. axis } 60^\circ}$ L.E. $\frac{+ 1{\cdot}50 \text{ D. sph.}}{+ 0{\cdot}50 \text{ D. cyl. axis } 60^\circ}$

Nearly two years (November 28, 1902) after the glasses were ordered, I again saw this patient, who told me that after the spectacles had been worn for about a week, the headache and other symptoms disappeared and had not recurred in the interval.

The cases given in brief above have been selected because they illustrate the following practical points :—

(1) That it is the low degrees of ametropia that have the greatest tendency to give rise to ocular headaches.

(2) That in such cases the sight at the distant types is usually normal or even better than normal.

(3) That it is of vital importance to correct even such low degrees of astigmatism as 0·25 D.

(4) That the greatest discomfort, as in the case of Mr. Percy P., is likely to be met with when astigmatism is asymmetrical as regards the two eyes, or when it is "against the rule" —that is, when the axis of the cylinder is horizontal, or nearly so, instead of being, as is the rule in hyperopic astigmia, vertical or nearly vertical.

(5) That the ametropia must be estimated under the influence of a cycloplegic, as atropine or homatropine. It may be remarked in passing that the relief to pain obtained during the use of those agents is sometimes very marked, a point upon which the late Mr. H. B. Hewetson[1] laid great stress.

I have already pointed out that the possession of normal vision does not exclude the existence of hyperopia or of hyperopic astigmia. But the contrary is the case with the remaining forms of ametropia — *viz.*, myopia, myopic astigmia, and mixed astigmia.

[1] Hewetson, H. B.: *Medical Times and Gazette*, March 21, 1885.

Every one of the defects named reduces the normal acuity of sight, but unfortunately, from the physician's point of view, errors of refraction other than hyperopia and hyperopic astigmia are relatively seldom the effectual causes of ocular headache.

The following is, therefore, quoted as a somewhat exceptional case :—

Mr. Andrew G., aged 22, was seen on January 21, 1897, complaining of paroxysmal pain in the forehead and temples of several years' duration. The attacks occurred on the average once a week. V. $\frac{6}{24}$ brought to $\frac{6}{6}$ with $\frac{+ 1{\cdot}0 \text{ D. sph.}}{- 3{\cdot}0 \text{ D. cyl. axis } 180^{\circ} \text{ D.}}$ The constant use of those glasses freed the patient from all discomfort, and when seen on August 1, 1902, he assured me that he had never experienced a moment's pain since he had used them.

It might be thought from some of the cases I have quoted that from the first moment a patient begins to wear glasses his complaints cease forthwith. Such is, however, by no means always the case. If the ametropia is almost fully corrected, many patients have to undergo a period of more or less discomfort before they reach a time when the glasses are really comfortable and relieve the headache which compelled them to seek professional advice. Many highly organized people have indeed

considerable difficulty in becoming used to glasses; while some, alas! will not persevere long enough to obtain any sensible relief. If the glasses are correct—not always an easy thing to make a patient believe under the circumstances—the only remedy is time. The uncomfortable feelings gradually become less and less marked, until in the course of two or three weeks they are no longer experienced.

One particularly annoying effect of correcting astigmatism in adults by means of cylindrical glasses is the so-called "binocular metamorphopsia." This alarming name simply means that there is an apparent distortion in the shape of familiar objects—for example, a picture frame, which may appear to be wider at one end than the other, although it is in reality oblong. The same sort of distortion is observed when going up and down stairs, and under other conditions that need not be more particularly specified. The change, which, as implied by its name, is visible only when both eyes are open, has been accounted for in various ways. The simplest explanation assumes that there is a natural conflict and contradiction going on in the patient's mind between the impressions of a lifetime and those which result from the recent correction

of an astigmatic and ametropic eye. Binocular metamorphopsia is complained of by observant people alone, and, above all, by artists. It can be overcome only by the constant and persevering use of the correcting glasses.

The following cases will illustrate the subject of binocular metamorphopsia :—

In September, 1893, a lady of 50 years consulted me on account of failing sight. Each lens showed signs of incipient cataract. R.V. $\frac{6}{18}$, − 1·0 D. sph. $\frac{6}{9}$. L.V. $\frac{6}{24}$ − 2·5 D. cyl. axis 60° $\frac{6}{9}$. Making due allowance for the presbyopia that was present, the following glasses were prescribed for near work: R.E. + 1·5 D. sph. L.E. $\frac{+ 2{\cdot}0 \text{ D. sph.}}{- 2{\cdot}5 \text{ D. cyl. axis } 60° \text{ D.}}$ With those glasses the patient, whilst in my room, could read the smallest type. A day or two after she had obtained her glasses, however, I received the following emphatic letter from the lady: "I have received my glasses, but am sorry to say they are quite a failure. I can see across a room very much better without than with them, and even when reading they make the page quite aslant. My husband and two of my children have put them on and they make everything appear crooked to them as they do to me. I have naturally a sharp eye for detecting if anything is out of the straight, and am

usually sent for when pictures are rearranged in the house to see if they are straight, so that I cannot in the least understand why the glasses produce this distortion. Possibly they would distort objects to you, as they do to me, if you looked through them."

Here is another letter received from an equally disappointed patient: "I am writing to tell you that the glasses you prescribed for me to always wear seem entirely wrong—the ground seems to rise, and such things as the table, dressing-table, window-ledge, etc., etc., seem all on the slant; also they make me feel giddy."

In conclusion, something must be said about megrim, an affection that in my experience, and in that of many others, is usually closely connected with ocular defects. This is no new observation, inasmuch as the connection was recognized by Piorry nearly eighty years ago, and has been commented on by many writers, including Airy, Liveing, Ranney, Hewetson, Lauder Brunton, Stevens, and George M. Gould, since that time. Indeed, in 1882, Dr. Savage,[1] of Jackson, U.S.A., announced that he had discovered the "real cause" (*sic!*) of sick-headache to be hyperopia and astigmia, and that its successful

[1] Savage: *Medical and Surgical Reporter*, July 29, 1882.

treatment consequently consisted in the use of proper glasses. In 1885, Mr. H. Bendelack Hewetson,[1] of Leeds, laid stress upon the fact that correction of errors by cylindrical glasses relieved not only the headache, but also the intermediate dyspepsia, insomnia, and irritability of temper, liable to occur in some patients between the bouts of megrim. Hewetson did not maintain that all migraine was due to an optical defect. But he claimed that in many, perhaps in most, cases it was entirely due to an error of refraction, and was capable of cure by the wearing of accurately adapted cylindrical glasses. It will be seen, then, that Hewetson (who was a pioneer in this country in recognizing some of the evils of eye-strain) laid great stress upon the influence of astigmatism in the causation of migraine. A year after Hewetson wrote, Dr. Ambrose L. Ranney[2] stated that "the symptoms of sick-headache are reflex in character to a large extent, and are due primarily in almost every case to some optical defect."

In 1888, a remarkable communication appeared from the pen of Dr. Georges Martin,

[1] Hewetson, H. B.: *Medical Times and Gazette*, March 21, 1885.

[2] Ranney, Ambrose L.: *New York Medical Journal*, February 27, 1886.

of Bordeaux.[1] Dr. Martin insisted upon the connection between astigmatism and migraine, although he did not deny the influence of two other factors, *viz.:* (*a*) A constitutional or diathetic element, the "arthritic," and (*b*) an occasional cause, according to the particular case. In proof of the important part played by a partial contraction of the ciliary muscle in the production of migraine, Martin adduced the following points: (1) That partial contraction of the ciliary muscle could be found in the eyes of all migrainous individuals; (2) that when one eye was alone astigmatic, migraine was always localized over that eye; (3) that when the two eyes were astigmatic to an unequal degree, the most frequent and violent crises of migraine appeared over the eye which presented the greater anomaly; (4) that migraine disappeared if spasmodic contraction of the ciliary muscle were overcome by means of atropine; and (5) that the constant use of cylindrical glasses correcting the asymmetry of the corneal meridians modified very sensibly the migrainous state, and sometimes yielded complete and lasting cures. Dr. Martin reported numerous cases of migraine cured by glasses.

[1] Martin, Georges: *Annales d'Oculistique*, 1888, tome xcix, pp. 24 and 105.

Nobody has been more emphatic as regards the connection between eye-strain and migraine than Dr. George M. Gould.[1] According to him, migraine is "almost always due to eye-strain, and, except in the rarest worn-out chronic cases, it is almost immediately curable by relieving the eye-strain." Gould[2] has never known a case of migraine or sick-headache in which it was strikingly manifest that near-use of the eyes was the cause of the disease.

Indeed, it is nowadays very generally admitted that the most cases of migraine are closely connected with eye-strain, and that they can be cured by the provision of proper glasses. This fact makes it all the more difficult to understand the position taken up by Mr. Percy Flemming[3] in a recent discussion at the Medical Society of London, on "Medical Cases in Ophthalmology." Mr. Flemming is reported as saying that "he did not think true migraine would be cured merely by correcting errors of refraction, as there was a general condition to be considered in addition." In the same discussion, however, Dr. H. A. des

[1] Gould, George M.: "Biographic Clinics," vol. iii, 1905, p. 46.

[2] *Idem, ibid*, p. 244.

[3] Flemming, Percy: *Transactions of the Medical Society of London*, 1911, p. 144.

Voeux[1] expressed his conviction that migrainous headaches were of ocular origin, and that he had yet to find a patient with migraine with normal eyes, although he admitted that all such patients were not cured by wearing glasses.

Speaking for myself, I do not for one moment doubt that the essential factor in migraine is eye-strain. Let me quote the following case where the sequence of cause and effect appeared to be singularly free from fallacy :—

A most intelligent medical friend had suffered slightly from megrim since he was seven years of age. But as he got older, and especially as he was reading hard for his professional examinations, the bouts became severer and more frequent. He was then affected, in fact, with classic "blind headache." The attacks began with a coloured and scintillating obscuration of central vision, and as this passed away, as it usually did in from five to ten minutes, intense unilateral headache came on. The attacks were always associated with nausea. They were brought on by indigestion and by straining the eyes, as with the microscope. General remedies did little if any good. The patient was in despair. At last, at the age of

[1] Voeux, H. A. des: *Transactions of the Medical Society of London*, 1911, p. 140.

about 39 years, the slight hyperopic astigmia that was present was corrected by spectacles (+ 0·5 D. cyl. 90°) for constant wear. The result was almost magical. The headaches became fewer in number and milder in character, and this has continued until the present time, some thirty years after glasses were prescribed. It may be added that violent headaches can still be induced by any attempt to use the eyes without glasses. In this patient there was a family predisposition to megrim: the patient's mother and sister were severely affected, and two of his children also suffered.

In the next case the relief afforded by weak glasses was very prompt and striking.

Miss Grace C., aged 22, consulted me in November, 1902. She was a fine, robust country girl, but had always been subject to headaches, which had become worse during the last two years. The pain, which was ushered in by ocular spectra, affected the frontal region, and usually lasted the whole day. It was followed by vomiting. She generally had two or three such attacks during the week. The eyes were stated to ache and to become red after close work. The headaches were definitely induced by reading or working. General medical and dietetic treatment had proved useless. Upon examination,

no defect of the external ocular muscles could be made out; there was 1·0 D. of hyperopia in the right eye and 0·75 D. in the left eye. Spectacles correcting this small defect were prescribed for constant wear. After six weeks' use of the glasses, Miss C. reported that there had been no return of the headache, and that the aching of the eyes had been lost.

Mr. A. E. G., aged 24, was referred to me by Mr. Alfred H. Tubby, on November 13, 1905. Since twelve years of age, Mr. G. had been subject to sick-headache, coming on for several years once in two months, but lately he has had as many as four attacks in a single week. The headache is associated with nausea and sometimes with vomiting. They are now and then preceded with tingling in the right hand, but much more commonly with coloured zigzags and left hemianopsia lasting for about half an hour. No aphasia. The pain in the head, which lasts, on an average, for twelve hours, comes on slowly and intensively, and passes away slowly. A sister, aged 36, is affected in a similar way. The vision was $\frac{6}{5}$. The refraction was as follows:

R.E. $\frac{+0{\cdot}50 \text{ D. sph.}}{+0{\cdot}25 \text{ D. cyl. axis } 150°}$. L.E. + 1·0 D. cyl. axis 150°. No muscular imbalance. The cylinders were prescribed for constant wear. When the

patient was seen some eight months later (July 14, 1906), he stated that during the first week he had his glasses he had two headaches, but that he had had none since. The constipation from which he formerly suffered had now disappeared.

Mr. H. T. B., aged 45, was sent to me by Dr. J. D. Windle, of Southall, on June 27, 1904. The patient had suffered from headaches all his life, but lately they had become worse. They occur about once in three weeks, last the entire day, are associated with vomiting, and are brought on by worry, fatigue, and so forth. The patient had consulted medical men, both in London and in the provinces, but without obtaining relief to his distress. Dr. Windle formed the opinion that the migraine was probably connected with the eyes, and hence sent Mr. B. to see me. V. $\frac{6}{9}$. No muscular imbalance. Under a cycloplegic, slight compound hyperopic astigmia with oblique meridians $\left(\frac{+ 0{\cdot}5 \text{ D. sph.}}{+ 0{\cdot}25 \text{ D. cyl. axis } 60^\circ}\right)$. Glasses for constant use were prescribed $\left(\frac{+ 0{\cdot}25 \text{ D. sph.}}{+ 0{\cdot}25 \text{ D. cyl. axis } 60^\circ}\right)$. These improved the headaches a good deal, and when a suitable presbyopic addition had been made, and a second pair of glasses ordered for reading, the patient went thirteen weeks without a single headache. He lost the vomiting entirely.

In the treatment of migraine by glasses it is, of course, most important that the exact optical correction be given. This somewhat obvious point is well brought out in a remarkable case reported at length by Dr. George M. Gould.[1] A student at the outset of his medical career suffered from "fiendish headaches," which came on several times a month, and on each occasion laid him up for some days. Glasses had been prescribed without benefit by several medical experts. Papillitis had been diagnosed, since one disc "was indistinct, the small vessels appeared to be covered with exudation, and the fundus conditions resembled optic neuritis." The patient was bluntly told that he had optic neuritis in one eye, and that eventually that eye, if not both eyes, would be lost. Dr. Gould prescribed glasses, which differed but slightly from those ordered by the other surgeons. They nevertheless sufficed to rid the patient completely of his complaints.

In common with other ophthalmic surgeons, I could quote case after case where the symptoms of migraine yielded to glasses, but there would be no object in doing so. I shall simply say, in my opinion, that *the eyes in every case of sick-headache should be examined as a matter of routine practice*. The position,

[1] Gould, George, M.: "Biographic Clinics," vol. vi, p. 181.

as I see it, has been accurately summed up by Dr. T. P. C. Kirkpatrick,[1] of Dublin, and his views carry greater weight from the fact that the gentleman in question is a general physician, and not an ophthalmic surgeon. The connection between eye-strain and migraine, writes Dr. Fitzpatrick, "has now been so frequently established that it is one of our first duties in every case of the disease to see that all sources of eye-strain have been removed, and not to be satisfied with any incomplete examination of the eyes, or protestation of the patients as to the excellence of their vision." Dr. Leonard Williams,[2] another well-known physician, is equally emphatic.

In conclusion, so intimate and so constant is the connection between migraine, on the one hand, and eye-strain, on the other, that, in my opinion, a physician should be chary in taking the contrary view. When a patient with sick-headache is returned with the report that the sight is "practically normal," I can only advise the practitioner to follow the advice recently tendered by Mr. Ernest Clarke,[3]

[1] Kirkpatrick, T. Percy C.: *Medical Press and Circular*, January 1, 1908.

[2] Williams, Leonard: "Minor Maladies and their Treatment," 1906.

[3] Clarke, Ernest: *Transactions of the Medical Society of London*, 1911, p. 142.

namely, that if he has reason to think that no cycloplegic has been used, he should return the patient to the ophthalmic surgeon for that to be done. "In that way only," said Mr. Clarke, "could they know that eye-strain had been eliminated." Speaking for myself, after a good many years' experience, I have yet to come across a case of migraine not influenced for the better or cured altogether by the intelligent use of glasses.

Now to turn to a second possible cause of ocular headaches, namely, the balance of the external muscles of the eyeball. Normally, those muscles should be so adjusted by means of their nervous supply as to cause objects, near or distant, to be "fixed" exactly and simultaneously by the two eyes. In other words, the visual axis of the eyes should meet at any object towards which they are directed, owing to the correct innervation of the external muscles of the eyes. If this state of muscular equilibrium be disturbed, a squint —manifest or latent—will be the result. The manifest or obvious squint (*heterotropia*) we may leave on one side, but the latent squint (*heterophoria*) is of interest from our present point of view. Provided the sight of the two eyes be approximately equal, the instinctive desire for binocular vision is usually so strong that although one eye tends to deviate

inwards or outwards, yet it is restrained from doing so by involuntary innervation, which, although unfelt, may give rise to a condition of muscular asthenopia.

A special nomenclature has been designed to indicate the various kinds of functional muscular anomaly. Thus, the condition of the eyes in a state of normal muscular balance is called orthophoria, while all departures are grouped under the name *heterophoria.* If there be a latent convergence of the eyeball, we speak of *esophoria,* and an excess of divergence is known as *exophoria.* The last-named condition has been known to oculists for years as "insufficiency of the internal recti," and is usually found in association with the higher degrees of myopia. Esophoria, on the other hand, is often combined with hyperopia. Should the visual axis of one eye tend to deviate upwards the condition is known as *hyperphoria,* "right" or "left" according to the eye affected. Combinations of these muscular defects may occur.

When these functional muscular anomalies give rise to symptoms of discomfort (which is by no means always the case), they may be relieved in several ways, of which the chief are the correction of any associated ametropia, exercise of the defective muscle or muscles, tonics or sedatives, as the case

may be, the use of prisms, outdoor exercises, and, finally, operations upon the muscles.

Heterophoria has been studied chiefly in America, where it is credited with producing not only eye-strain and headache, but even such different disorders as "neuralgia," insomnia, disturbances of nutrition, neurasthenia, chorea, epilepsy, and some forms of insanity. With regard to this point I cannot refrain from quoting the eminently sensible remarks of Drs. Hansell and Reber,[1] two well-known American ophthalmic surgeons: "When all circumstances are favourable," they write, "reflex neurosis may arise from muscular anomaly, and there is no doubt that, in a few instances, the claims made by enthusiastically credulous writers are justified, but such cases are exceptional in even the largest experience, and the theory that a considerable proportion of the insane, of the epileptic, of the choreic, owe their disease wholly to the existence of either a refractive error or a consequent muscular anomaly, is dangerous and unsound."

The view that heterophoria may cause chorea and epilepsy and insanity has met with little favour in this country, where much less importance appears to be attached to disorders of fixation than in the United States.

[1] Hansell, H. F., and Reber, W.: "The Ocular Muscles," second edition, 1912, p. 78.

The condition is common enough in Great Britain, but practically only in association with errors of refraction. Here the general opinion seems to be that its effects can usually be minimized by correction of the co-existing ametropia, without special attention to the muscular anomaly itself. Hence, in England we hear little of the "graduated tenotomies" so dear to the hearts of a few Transatlantic ophthalmic surgeons.

Speaking for myself, I have met with a few cases of vertical deviation (hyperphoria or hypophoria) where headache and other reflex neuroses were promptly relieved by suitable prisms. It will suffice to quote a single case of this description. Miss Amelia P., aged 26, complained of vertical headaches, which had commenced when the patient was about 15 years of age. They had become much worse since an attack of scarlet fever six or seven months before I saw the young lady. They were brought on by use of the eyes, as well as by visits to the crowded streets of London (the so-called "panorama headache"), and were most marked during her menstrual periods. Vertigo was occasionally present. There was no error of refraction, but a right hyperphoria of 1° existed, and when this was fully corrected by a weak prism before each eye the result was both prompt and satisfactory.

III. On Some Unusual Forms of Migraine in Children.

It would be a truism to say that many, perhaps most, of the headaches of children belong to the migrainous type. That fact, of course, is known to every medical man who has much to do with children. It is, I suppose, equally well recognized that juvenile migraine offers certain peculiarities, as examples of which one need merely mention the common bilaterality of the headaches, the marked tendency to periodicity, the relative frequency of tinnitus as a sensory manifestation, and the comparative rarity of premonitory hemianopsia or teichopsia. In fact, like some other diseases, migraine, as it occurs in childhood and in later life, offers several points of contrast, two or three of which it is the purpose of the present paper to illustrate with cases drawn from my practice. I can entertain no doubt that these forms of migraine, although perhaps uncommon, are perfectly familiar to most physicians, so that I wish to disclaim the least originality for

my subsequent remarks. I do not purpose to touch upon that peculiar condition in children which has been described (somewhat unfortunately) as "hemicrania with third nerve paralysis," the *migraine ophtalmoplégique* of Charcot, since such cases have an entirely different pathology from the vaso-motor cortical changes believed to lie at the root of ordinary migraine.[1] In all the cases of this rare and curious affection examined after death, organic changes—as tumour or tuberculous or inflammatory exudation—have been found to involve the third nerve itself at the base of the brain (*see* A. W. Stirling, *Archives of Ophthalmology*, July, 1905).

The particular cases to be described may be grouped under three heads, as follows: (1) Migraine preceded, accompanied, or followed by temporary aphasia; (2) migraine replaced by bouts of vomiting; and (3) migraine associated with alterations of sensation or disturbances of mobility in the upper or the lower extremities.

[1] Although the third is the most commonly attacked, yet other cranial nerves, as the fourth, fifth, sixth and seventh, may be affected.

(1) Migraine preceded, accompanied, or followed by Temporary Aphasia.

Case 1.—George D., a neuropathic lad, aged 10, was brought to me in December, 1900, because he was backward in reading and complained of "colours" before his eyes. There was a family history of migraine, preceded by hemianopsia, on his mother's side. The relative visual acuity was R. $\frac{6}{12}$; L. $\frac{6}{12}$. Under atropine, the refraction was found to be R.V. $= \frac{6}{18} \frac{+0{\cdot}5\text{ D.}}{+0{\cdot}25\text{ D. }180^\circ} \frac{6}{6}$. L.V. $= \frac{6}{12} \frac{+0{\cdot}75\text{ D.}}{+0{\cdot}25\text{ D. }180^\circ} \frac{6}{6}$. The external muscular balance was perfect ("orthophoria"). According to the history given, the lad had suffered from three attacks of migraine before he was brought to me. Each bout began with an alteration in speech and a numbness in the right arm, and was followed by persistent vomiting. The boy, it may be noted, was right-handed. Glasses were ordered for constant use, and it is gratifying to report that the migraine soon became a thing of the past.

Case 2.—Gertrude S., aged 12, had been subject to attacks of migraine for three years. They occurred about once a month, and were induced by excessive use of the eyes upon near objects. There was a marked history of migraine, with hemianopsia, on both sides of

the family. The attacks in this child began with tinnitus and vomiting and "colours" before the eyes, and during the time they lasted (usually the entire day) the child either refused to speak at all, and became very irritable if pressed to do so, or, if she attempted to speak, jumbled her words together. Orthophoria. Vision two-thirds normal. Under atropine, R.V. $= \frac{6}{60} \frac{+1{\cdot}5 \text{ D. sph.}}{+0{\cdot}5 \text{ D. cyl. } 90^{\circ}} \frac{6}{6}$. L.V. ditto. Constant use of glasses almost fully correcting the compound hyperopic astigmia that was present, reduced the number and severity of the headaches, and at the same time relieved the aphasia.

Case 3.—Alan P., aged 8, was seen in October, 1905, with the following history: For the last two years the lad had been subject to violent headaches, occurring on the average once in two weeks, and generally lasting twenty to twenty-four hours. The attacks terminated in an access of vomiting, and for several hours thereafter the boy could scarcely speak and tended to call common things by their wrong names. The correction by spectacles of the small amount of hyperopic astigmia (+ 0·25 D. cyl. axis 180°) that existed in this patient was without effect upon the migraine, but there was reason for thinking that the glasses were not worn constantly.

(2) Migraine replaced by Bouts of Vomiting.

Case 4.—Samuel H., aged 8, was brought to the Eye Department of the Queen's Hospital for Children on March 15, 1906, with the statement that since he was two years of age he had been subject every fortnight or so to fits of violent and prolonged vomiting. These attacks generally came on at five or six o'clock a.m., and lasted, as a rule, the entire day, although on occasion they had been known to persist for as long as three days. The emesis took place independently of food, and the vomited matters consisted mainly of "frothy white water." Upon close inquiry, the lad himself stated that now and then the vomiting was preceded by headache, although usually the former occurred alone. Samuel H. was one of seven children, of whom six survived. None of the others were affected in a similar way, but it is perhaps significant that two of them wore spectacles. His mother, maternal grandfather, and a maternal aunt suffered from so-called "sick-headache." Vision was equal to one-half normal. Under atropine, R.V. $= \frac{5}{60} \frac{+5{\cdot}0 \text{ D. sph.}}{+1{\cdot}0 \text{ D. cyl. } 90^{\circ}} \frac{5}{9}$. L.V. $= \frac{5^{+}}{60} \frac{+5{\cdot}0 \text{ D.}}{+2{\cdot}0 \text{ D. } 90^{\circ}} \frac{5}{9}$. The sight could not be brought above this point, even when a pin-hole diaphragm was placed in front of the optical

correction. The media of the eye were clear. There was well-marked "pseudo-neuritis"—that is to say, the nasal edge of each optic disc was imperfectly defined, and could not be rendered sharp with any glass. This condition, as I have pointed out elsewhere (*Reports of the Society for the Study of Disease in Children*, vol. iii, 1903, p. 342), is common among children. Thus it was present in as many as 26 (22·80 per cent.) of 114 children whom I examined ophthalmoscopically when investigating the condition a few years ago. In the present patient it might excusably have led to an error in diagnosis unless one were familiar with this ophthalmoscopic appearance. The combination of persistent vomiting and blurred optic discs would, under the circumstances, have been suggestive of some intra-cranial mischief.

In Cases Nos. 4, 5, and 6, of which I do not purpose to give details, headaches formed an insignificant feature of the migraine, while vomiting was the symptom that led the patients, all children between the ages of 10 and 14 years, to seek medical advice.

(3) Migraine associated with Alterations of Sensation or Disturbances of Mobility in the Upper or the Lower Extremities.

The first case quoted in this paper furnishes an instance of alterations in sensibility under the guise of numbness in the right arm, ushering in an attack of migraine. The next case, No. 7, is an example of disturbance of mobility following migraine. The facts are as follow: Harriet T., aged 17, came under my notice early in March, 1906, on account of headaches severe enough to incapacitate her temporarily from her work, that of a domestic servant. The headaches had commenced when she was six years of age, and even then were severe enough to cause her to be dismissed from school when they came on. They could be induced by reading or by straining the eyes in any way. The patient belonged to a large family (six brothers and five sisters), none of the other members of which suffered from frequent or severe headaches. Her mother, however, was affected with "sick-headache." Harriet T.'s headaches began with mistiness of the sight, followed by pain in the left side of the brow, and by retching and vomiting. The headache, as a rule, lasted

for two days. It was invariably followed by marked twitching in the right arm and slight twitching in the corresponding leg, lasting for about a day. No alterations in speech had been noted. The patient was affected with a considerable degree of compound hyperopic astigmia ($\frac{+ 5{\cdot}0 \text{ D. sph.}}{+ 2{\cdot}0 \text{ D. cyl. axis } 60^{\circ}}$) the correction of which by glasses brought sight to about two-thirds normal. The constant use of suitable spectacles gave a considerable amount of relief to the hemicrania. It should be noted, finally, that this patient had suffered from rheumatic fever and chorea about a year before she fell under my notice.

Remarks.

If we accept the current views as to the causation of migraine, we shall experience little difficulty in understanding the several types of the affection described in this paper. Vasomotor changes of the cerebral cortex, or of the meninges of the occipital region, are commonly believed to be the immediate cause of the visual manifestations of migraine. These can readily spread over to, or for that matter originate in, the cortical areas concerned with speech or hearing or with movements of the arm and leg. Gonzalez (*Annales de Oftalmologia*, July, 1905) has

published two cases of migraine, each associated with aphasia only when the hemicrania was left-sided. When the pain was on the right side of the head there was no aphasia. The first case mentioned in this paper, which was observed in a right-handed boy, was associated with aphasia and numbness in the right arm. Unfortunately, my notes do not make it quite clear whether the pain was in the left side of the head.

A similar strain of reasoning would explain the sensory changes occasionally met with in migraine.

I may take this opportunity of stating that I have met with a few cases in which severe vertigo, not associated with any particular headache, or with organic disease, occurred in children, under such circumstances as to lead me to suspect that it was nothing more or less than a manifestation of migraine. I only regret that I am not in a position to give precise details of the cases.

IV. On Habit-spasm and Eye-strain.

One phase of the functional nervous disorder known as "habit-spasm" falls not infrequently under the notice of those who practise ophthalmology.

A child, most frequently of from 5 to 12 years, who is almost invariably described by his mother as "nervous," is brought for advice on account of jerking movements of the eyelids, often accompanied by a drawing-up of the angle of the mouth. A less common manifestation is a trick of turning the eyes themselves suddenly upwards or downwards. These signs may, and often do, make up the sum total of the ailment. But there may be convulsive movements of the tip of the nose, the forehead, shoulders, arms, hands, or legs, and a tendency to make uncouth noises, variously described as "grunting," "clucking," "sniffling," or "hiccoughing."

It is widely recognized that the condition outlined above is little influenced by drugs, of which the favourites appear to be arsenic and the bromides. More is usually to be

gained by taking the child from school and sending him to the seaside or to the country.

Now the point I desire to emphasize about many of these cases, more particularly those in which blinking of the eyelids is the chief manifestation of the habit-spasm, is that correction of any error of refraction, no matter how trivial it may appear, will often check the "tic," as it is sometimes called. I have seen many instances of this sort, and have accordingly come to look upon the provision of spectacles as forming an essential part in the treatment of such cases. At the same time I am very far from asserting that a pair of glasses will cure every case of habit-spasm. My experience, however, amply warrants the claim that many cases are benefited by so simple a means.

In these cases the eye appears to form, as it were, the starting-point of a reflex irritation, which in a neuropathic child may determine the singular spasm under discussion. It is probable that almost any other source of peripheral irritation, such as inflammation of the conjunctiva, adenoids, worms, a decayed or painful tooth, or a tight and adherent prepuce, might have a similar effect in a child whose nervous system was in an excited and overstrung state.

In the following case the sequence of cause and effect was clearly shown:—

Case 1.—Arthur K., a nervous and stuttering Jewish lad, aged 7, was referred to me by Mr. Alfred H. Tubby on January 14, 1902, because he was stated "to blink at night." The condition, which dated from an attack of conjunctivitis two years before, had become more marked lately. On examination, vision $\frac{6}{6}$ and No. 1 Jaeger. A drop of atropine placed in the eyes stopped the spasm as soon as the pupils were dilated. The refraction was found to be hyperopic, with some astigmia (+ 2·0D. sph. with + 0·5D. cyl. axis 90°), and glasses were ordered to be worn for all purposes. When the lad was seen a month later (February 13, 1902) there was no habit-spasm. The glasses were then directed to be worn for reading alone. Some nine months later (November 28, 1902), however, he was again brought, with the history that blinking had recurred during the last three days. The symptoms speedily disappeared when the glasses were again worn constantly. It was noted that the eyes were steady when the spectacles were in place, but spasm recurred the moment they were taken off. When last seen, on March 21, 1903, there had been no recurrence.

The distinction between habit-spasm, on the one hand, and incipient chorea, on the other, is now and then more difficult than might at first sight appear. The points to which I am accustomed to attach the most importance are : (1) The repetition and localized nature of the convulsive movements ; (2) the long duration of the symptoms without particular alteration ; and (3) the cessation or reduction of the spasm as soon as accommodation is paralysed, as it can readily be, by placing a drop of atropine (or other cycloplegic) in the conjunctival sac.

The following case is of particular interest because, until it fell under my care, it was considered by a most competent colleague to be an instance of chorea :—

Case 2.—Charles L., aged 9, had been treated for chorea for four months before I saw him for the first time on September 4, 1906. He was a sleep-walker, and was apt to talk about his school lessons in his sleep. He had suffered from night terrors. He showed blinking of the eyes, twitching of the nose, movements of the mouth, and shrugging of the shoulders. A drop of atropine placed in each eye stopped the spasms at once. The refraction was + 1·5D. sph. with 1·5D. cyl. axis 90°. Spectacles were prescribed for

constant use. October 23, 1906: With glasses on, no blinking, which supervenes the moment they are removed. January 1, 1907: Eyelids now steady, with or without glasses. January 28, 1908: Recurrence of the twitching, which is said to be present even during sleep; atropine at once relieved the child of the symptom. August 25, 1908: After a period of complete freedom, the lad is now said to be blinking again. May 4, 1909: The patient seldom blinks, although he is apt to do so when excited.

The following cases are taken almost haphazard from my notebooks:—

Case 3.—Martha N., aged 12, was referred to me by Dr. George Carpenter on March 21, 1902. Blinking was frequent, the eyeballs occasionally moved rapidly upwards, and the nostrils twitched. V. $\frac{5}{5}$ and No. 1. Jaeger. Under atropine: R.V. $\frac{5}{12}$ + 1·0D. sph. with + 0·5D. cyl. axis 180° $\frac{5}{5}$; L.V. $\frac{5}{18}$ + 1·5D. sph. with + 0·5D. cyl. axis 180° $\frac{5}{5}$. Spectacles for constant use were speedily followed by cessation of all the symptoms of habit-spasm.

Case 4.—Edward K., aged 11, attended on March 28, 1905. Since a severe attack of scarlet fever three years ago, he has been affected with unsteady and blinking eyelids,

and the condition is believed to be getting worse. The right is said to be more affected than the left eye. Movements of the lips have also been observed. The lad, who is in the fifth standard at a Council School, is described as "fearfully nervous." His mother is in an asylum for the insane. On examination, R.V. $\frac{5}{24}$ and No. 1 Jaeger; L.V. $\frac{5}{9}$ and No. 1 Jaeger. On April 11, 1905 (under atropine), R.V. $\frac{5}{24}$ – 0·5D. sph. with + 2·5D. cyl. axis 80° $\frac{5}{12}$; L.V. $\frac{5}{8}$ + 0·5D. sph. axis 80° $\frac{5}{5}$. On May 9, 1905—that is, about a month later—the lad was stated to be much less "nervous," while the blinking was absent as long as the glasses were in place, but recurred, in modified form, as soon as they were taken off.

Case 5.—Hubert W., aged 11, first seen on March 22, 1904, on account of blinking of the eyelids, present for about six months. Child described as "very nervous." V. $\frac{5}{6}$. Under atropine, R.V. $\frac{5}{9}$ + 0·50D. sph. with + 0·25D. cyl. axis 90° $\frac{5}{5}$: L.V. $\frac{5}{9}$ + 0·25D. cyl. axis 90° $\frac{5}{5}$. Glasses were prescribed for constant use, and when the patient was seen on May 3, 1904, the habit-spasm had practically disappeared.

Case 6.—Mary L., aged 9, seen at the Evelina Hospital, London, on September 3, 1907. The history was that she had com-

menced to twitch her fingers and hands three years ago, but the symptoms passed off without medical treatment. A year ago the face began to "twitter." She was described as a very excitable child. There was no history of rheumatism, and the heart sounds were normal. On examination, R.V. $\frac{6}{9}$ and No. 1 Jaeger; L.V. $\frac{6}{6}$ and No. 1 Jaeger. Under atropine, R.V. $\frac{6}{18}$ + 1·5D. $\frac{6}{6}$; L.V. $\frac{6}{18}$ + 1·5D. $\frac{6}{5}$. Fundi normal. Glasses + 1·0D. sph.) were prescribed for constant wear. When seen on September 16, 1907, the face was much steadier, and the improvement, according to the mother's statement, had set in as soon as the glasses were obtained. The child was last seen on January 5, 1909—that is, about sixteen months after the glasses had been prescribed—and there was neither blinking of the eyelids nor twitching of the face. The sight with glasses was $\frac{6}{5}$.

There would be no difficulty in multiplying the recital of cases in which, in my experience, spectacles have relieved habit-spasm, although no useful purpose could be served by doing so.

In conclusion, I may be permitted to lay some stress upon one or two points, the first of which is that children whose habit-spasm is relieved by glasses seldom complain of symptoms which point to eye-strain, such as would

be likely to put the practitioner upon his guard. The difficulty is increased by the fact that the sight of such children is usually good, and on occasion may even exceed the ordinary standard ($\frac{6}{6} = 1$). No dependence whatever should be attached to an estimation of refraction that has not been made when accomodation has been fully paralysed by the use of atropine. Lastly, the ametropia—invariably, in my experience, hyperopia with or without astigmia—should be almost fully corrected by glasses to be worn for every purpose.

V. On a Common Appearance of the Optic Disc liable to be Mistaken for Optic Papillitis ("Pseudo-neuritis").

When a physician uses his ophthalmoscope he generally searches for a few well-defined fundus changes, of which optic neuritis is without doubt the chief. It is, therefore, of the first importance that he should know how to avoid any pitfalls that may lie in the way of the diagnosis of the condition.

In both children and grown-up people there is an appearance of the optic disc that is sometimes spoken of as the "hypermetropic disc," or "pseudo-neuritis," or "pseudo-papillitis," for the first clear account of which we have to thank Galezowski.[1] It constitutes in many cases a very serious source of fallacy in the diagnosis of papillœdema. Its existence, of course, is familiar to every ophthalmic surgeon, but from my inquiries I feel sure that many physicians either ignore its existence altogether

[1] Galezowski: "Traité Iconographique d'Ophtal.," 1886, plate xi, fig. 4.

or else attach far too little importance to its occurrence.

Nevertheless, the following figures go to show that "pseudo-neuritis," of some degree at all events, is extremely common among children generally.[1]

I have examined 114 children, belonging to both sexes, whose ages ranged from 2 to 16 years, and who enjoyed good health. No complaints were made about the eyes, which were examined in the first instance for the purpose of estimating refraction, but in doing this, particular attention was paid to the existence of the condition in question. Of the total number of the children examined, it was found that as many as twenty-six (that is 22·80 per cent.) presented some "pseudo-neuritis." Broadly speaking, then, about one child in every four and a half examined by me had more or less ill-defined optic discs.

It is rather a singular coincidence that Dr. H. C. Bristowe[2] found the condition to be present in twenty-nine among 129 patients, *i.e.*, in 23·2 per cent., or in almost the same proportion as that given above. Some of Dr.

[1] Stephenson, Sydney: *Reports of the Society for the Study of Disease in Children*, vol. iii, 1903, p. 342.

[2] Bristowe, H. C.: *Ophthalmic Review*, vol. x, 1891, p. 321.

Bristow's best-marked cases were in persons aged over 30.

In view of the foregoing figures, placed on record a good many years ago, it is a little difficult to understand why Dr. James Bordley[1] speaks of the condition as being "fairly rare," unless he refers to marked examples alone, which admittedly are not common. On a similar supposition we may explain the figures quoted by Dr. Bernhard Nottbeck,[2] who amongst 9,361 eye patients at Marburg found twenty cases of "pseudo-neuritis," or the extremely low percentage of 0·214.

The ophthalmoscopic appearances of "pseudo-neuritis" in certain instances, as I have said before, simulate those of true optic neuritis. So much is this the case that it may be quite impossible to differentiate between the two conditions upon a first examination of the eyes. Indeed, so striking is sometimes the resemblance that in my own mind I am convinced that of the many cases diagnosed as "optic neuritis" by physicians some must really have belonged to the spurious group.

We may conclude, then, that although a

[1] Bordley, James, junr.: *The Ophthalmoscope*, January, 1911.

[2] Nottbeck, B.: v. Graefe's *Archiv f. Ophthal.*, Band xliv, 1897, S. 31.

degree of "pseudo-neuritis" is quite common in the eyes, both of children and adults, yet such a condition as would be mistaken by an expert ophthalmologist for optic neuritis is distinctly rare.

Cases are known where the mistake has actually occurred. For example, in a case reported by Dr. George C. Harlan,[1] the conjunction of severe headaches, dizziness, and occasional diplopia, with swollen (+ 1·5D.), striated, and badly-defined optic discs caused great anxiety, although sight and visual fields were normal. The fact that the appearances remained without change for two months caused Harlan eventually to look upon the condition of the optic discs as "congenital." Again, the diagnosis of "optic neuritis" was made in the curious case reported by Mr. W. T. Holmes Spicer,[2] where a lad, aged 11½, suffered from headache, pain in the eyes, and blinking. The sight was normal. There was no latent error of refraction to account for the symptoms. The edges of the discs were so indistinct that they could scarcely be said to exist, and while the vessels on

[1] Harlan, G. C.: *Trans. Amer. Ophthal. Society*, vol. iii, 1880-1884, p. 731.

Spicer, W. T. Holmes: *Trans. Ophthal. Society U.K.*, vol. xvi, 1896, p. 134.

the papilla could be seen with a + 3D. lens, those on the fundus could be seen without any lens at all. The disc was therefore swollen about 1 mm. The vessels curved as they passed from the disc to the retina, and *vice versa*. The patient was kept under observation for upwards of three years, and was then exhibited at the Ophthalmological Society of the United Kingdom as an example of "spurious optic neuritis."

One of the cases reported by Dr. Bernhard Nottbeck[1] belonged to this class. The patient, a healthy lad, aged 14, complained of asthenopic symptoms. There was opacity and swelling of both optic discs, more marked in the right eye (3·0D.) than in the left (2·0D), together with tortuous retinal vessels. The sight of the right eye (corrected) was $\frac{4}{18}$ and that of the left $\frac{6}{6}$. The visual fields and colour sense were normal in each eye. Under these circumstances the diagnosis of "optic neuritis" was made, and the patient was treated with sublimate injections, atropine, the artificial leech, and so forth. But no change took place during the seven years the patient remained under observation, and long before the end of that period, the diagnosis had been changed to one of "pseudo-neuritis."

[1] *Loc. cit.*

Finally, in a case brought before the Moscow Ophthalmological Society by Dr. W. Strachow,[1] a woman, aged 45, whose menstrual life had been of a chequered type until the menopause was reached at 38 years, and who suffered from headaches and insomnia, showed a similar appearance of the optic discs; but here, again, as treatment with mercury and potassium iodide led to no appreciable result, the diagnosis of "pseudo-neuritis" was ultimately arrived at.

The opposite and more serious error may also be made, and true neuritis be mistaken for "pseudo-neuritis," as in the following case from my own practice:—

A case of optic papillitis, due to a cystic glioma of peduncles and pons, mistaken for "pseudo-neuritis" in a patient aged 14, *with normal sight and visual fields. Operation and death.*

Master N. C., aged 14, was brought to me on November 21, 1908, by Dr. L. R. Lempriere, Resident Medical Officer of Haileybury College, Hertford. According to the history, the patient had been subject for about three months to vomiting on awaking in the morning. When he returned to college after the summer vacation, about the middle of

[1] Strachow, W.: *Klin. Monatsbl. f. Augenheilk.*, 1909, i. S. 655.

September, Dr. Lempriere was unable to find any organic mischief to account for the symptoms, which had commenced during the holidays. At the beginning of November Dr. Lempriere ascertained that the emesis, which bore no relation to food, was usually associated with some frontal headache, and that there was slight giddiness at times. On examining the eyes with the ophthalmoscope, he observed that the edge of each optic disc was blurred, although the retinal vessels were not "engorged." Vision was $\frac{6}{9}$ (three letters). The fields of vision were full. Knee-jerks active. Pulse, 60 per minute, was small and irregular. Urine, sp. gr. 1025, alkaline, no albumin, but much mucus and many phosphates. No oculomotor paralysis. Bowels rather constipated. The boy did not seem ill in himself.

When I saw the patient (November 21, 1908) I found vision to be $\frac{6}{5}$ (partly) in each eye, and the pupils to be equal and active. The field of vision, as tested with a 10 mm. white square, was perhaps a little contracted, 5° to 10° on the outer side in both eyes, and 10° on the inner side and below as regards the right eye. Refraction, estimated under a cycloplegic, was right eye + 0·5D. sph. with + 0·35D. cyl. axis horizontal, and left eye + 0·25D. sph. The optic discs were a little

blurred upon the nasal side, but no loss of transparency and no œdema was present. The retinal veins over the fundus generally had a somewhat darker hue than usual, but could not be said to be "engorged." In short, there was no definite evidence of optic neuritis so far as I could satisfy myself. In the hope that the vomiting might possibly be due to eye-strain, and pending further developments, glasses which fully corrected the error of refraction were prescribed for constant wear.

In the further progress of the case, the morning sickness became less frequent, and the headaches less pronounced, and the lad seemed altogether better. On December 17 I again examined the patient. Sight was as before. The fields of vision for white were, if anything, rather larger than when first taken, a month previously.

I next saw Master N. C. on January 21, 1909, *i.e.*, two months after he first came to me, when the state of affairs had changed markedly for the worse. During the Christmas holidays the lad had been listless and sleepy all day. All his energy seemed to have left him, and he had become very irritable. He had complained of pain usually in the occipital region, but at times at the top of his head and behind the eyeballs. He had vomited and

retched, especially in the mornings. On examination, lateral nystagmus was found to be occasionally present. The pupils were equal and active. Vision was unaltered (= $\frac{6}{5}$ partly). The limits of the field of vision for a white object now *exceeded* the normal in almost every meridian of the charts. But the optic discs were very blurred all around their edges, and the summit, more particularly in the left eye, could be seen with a + 2·0D. lens, or, in other words, the discs were slightly though definitely swollen. The retinal veins were somewhat distended. No retinal hæmorrhages or exudations were to be seen.

The sequel of the case was sad, for death occurred on February 8, 1909, from shock, after a couple of decompression operations by Sir Victor Horsley for the relief of a cystic glioma probably involving the peduncles and pons.

The condition described as "pseudo-neuritis," of course, is very different from that in which the optic disc looks blurred in consequence of astigmia, regular or irregular. In the first case, although imperfectly defined to direct ophthalmoscopic examination, yet the apparent haziness of the optic disc will resolve when the indirect method is employed. In the second the well-known distortion appearances of irregular astigmia will be apparent

when both mirror and lens are used, the mires of the ophthalmometer may show the more or less characteristic deformities, and the patient may complain of multiple images. Still, it is on record that confusion has arisen, as in a case reported by Dr. Swan M. Burnett,[1] of Washington, who was consulted by a young lady, treated by another oculist for many months for "optic neuritis" of the left eye, believed to have followed a severe illness, during which there had been violent vomiting. V. = $\frac{5}{15}$, with a general haziness and horizontal streakiness across all the letters of the test type. There was marked blurring of the retinal vessels near the upper and inner edge of the optic disc, which looked slightly paler than its fellow. The edge of the disc was elsewhere well defined. No corneal or lental opacities. By examination with the ophthalmometer, irregular curvature, limited to the nasal quadrants of the cornea, was found, and by retinoscopy a simple myopic astigmia of about 1D. against the rule. With the aid of a stenopæic hole, sight could be raised to $\frac{5}{6}$.

It can hardly be doubted that such expressions as "woolly discs," "engorged lymph sheaths," "suffused nerve head," and so forth,

[1] Burnett, Swan M.: *Amer. Journ. of Ophthalmology*, August, 1904, p. 225.

common in American reports of cases of eye-strain, often refer to the condition described in the present communication. In America, however, it is held by some observers that true optic neuritis may result from eye-strain, and it is evidently to this condition that the authors intend their expressions to apply. A similar view has been held in England. Mr. John Couper[1] believed that prolonged use of the eyes in some cases of hyperopia might induce swelling of the discs, sometimes mistaken for, and treated as, slight optic neuritis. The view was endorsed by Sir William R. Gowers,[2] who wrote: "It is known that, in hypermetropia, prolonged close work may occasion considerable congestion of the optic discs. Its frequent presence in optic neuritis suggests, further, that hypermetropia may be a determining factor in producing and aggravating inflammation of the nerve when other causes are present."

The slighter grades of "pseudo-neuritis," which, as already said, are in my experience quite common, present a blurring or haziness,

[1] Couper, John: Quoted by J. Hughlings Jackson, *Trans. Ophthal. Society U.K.*, vol. i, 1881, p. 66.

[2] Gowers, Sir William R.: "A Manual and Atlas of Medical Ophthalmoscopy," fourth edition, edited by the author and Marcus Gunn. London, 1904, p. 95.

as it were, of the nasal edge of the disc, so that it may be difficult to say exactly where the disc ends and the neighbouring fundus begins. The resemblance to a commencing optic neuritis is sometimes very deceptive. In association with the localized haziness of the disc three other appearances are common: first, absence of the physiological cup; secondly, some glistening connective tissue alongside the central vessels on the optic papilla; and, thirdly, a degree of tortuosity of the retinal arteries and veins over the fundus generally.

More pronounced examples of "pseudo-neuritis" show a distinct woolliness of the nasal edge of the disc, which is greyer than normal. In more advanced grades still, the entire margin of the optic disc becomes ill-defined, and so diffuse that it is impossible to differentiate it from the neighbouring fundus. Striation is sometimes a marked feature. The papilla appears to be definitely swollen. The condition can scarcely be distinguished from a developed optic neuritis.

In the most pronounced grade of all, it becomes impossible to decide where the disc ends and the fundus begins, so hyperæmic and indistinct does the former appear. To judge from the look of the vessels, the disc is distinctly œdematous.

Finally, it should be added that the change, although in my experience always bilateral, is not necessarily equal in degree as regards the two eyes.

It will thus be seen that while the slighter cases of "pseudo-neuritis" may be mistaken for a commencing optic neuritis, the more marked ones may be confused with a well-developed optic neuritis. In point of fact, the blunder is not only excusable, but under some circumstances, as I have elsewhere shown, almost impossible to avoid.

A situation of no little uncertainty and of some danger is thus created. How can we distinguish the two conditions, true neuritis and "pseudo-neuritis," from one another?

The main differentiæ appear to me to be the following :—

(1) "Pseudo-neuritis" is a congenital condition, neither receding nor advancing, no matter how long a case remains under observation. Indeed, if the appearances changed, I should myself be inclined to doubt the diagnosis of "pseudo-neuritis." True neuritis, on the other hand, begins, develops, reaches its height, and is then replaced by atrophy, partial or complete, of the disc or (in rare cases) by return to the normal. Therefore, if we find that a blurred state of the optic disc supervenes

while a patient is under observation, or if it becomes more pronounced under those circumstances, we may safely conclude that we are dealing with a true optic neuritis. That the period of observation may have to be of considerable length is shown by cases quoted earlier in this communication.

It has been maintained by Mr. W. Adams Frost[1] that the mere fact of the ophthalmoscopic appearances remaining without alteration is no argument whatever against the condition being one of optic neuritis, since cases of neuritis may undergo subsidence and then present a permanent appearance resembling that of "pseudo-neuritis." He spoke of having seen several such cases. In the same discussion Mr. Gustavus Hartridge[2] urged that "persistent optic neuritis" would be a better name than "pseudo-neuritis" for cases such as those mentioned by the former speaker. If the foregoing views be adopted, then a stationary ophthalmoscopic appearance may be taken as indicating either a case of "persistent optic neuritis" or one of "pseudo-neuritis." In practice, however, it would almost certainly be interpreted by most observers as forming

[1] Frost, W. Adams: *Trans. Ophthal. Society U.K.*, vol. xvi, 1896, p. 136.

[2] Hartridge, Gustavus: *Ibidem*, p. 136.

a strong point in favour of the diagnosis of "pseudo-neuritis."

The anatomical justification of Mr. Frost's views, as outlined above, is perhaps to be found in a case under the care of Professor Axenfield.[1] A male patient, aged 30, suffering from progressive paralysis of syphilitic origin, presented during the thirteen months he remained under observation an appearance of the left optic disc believed to indicate "pseudo-neuritis." Owing to circumstances, no functional examination of the eyes could be made. The autopsy showed evidences of true optic neuritis and peri-neuritis.

(2) "Pseudo-neuritis" of itself gives rise to no disturbance of sight, although in my experience it is not uncommon for some degree of so-called "congenital amblyopia" to complicate the case. On the other hand, even advanced optic neuritis, as first pointed out by Blessig and afterwards insisted upon by Dr. J. Hughlings Jackson, need not affect vision. The late Dr. Stephen Mackenzie[2] is responsible for the statement "that in the practice of physicians who examined all their cases with the ophthalmoscope. . . at least one half, if not more,

[1] von Graefe's *Archiv f. Ophthal.*, Band xliv, 1897.

[2] Mackenzie, Stephen: *Trans. Ophthal. Society U.K.*, vol. i, 1881, p. 95.

of the cases in which optic neuritis was discovered, it would be found unassociated with any marked, and often without appreciable, defect of sight." Hence, the mere visual acuity in a given case can scarcely be depended on either way for purposes of diagnosis. At the same time, if we came across what seemed with the ophthalmoscope to be a well-marked optic neuritis co-existing with full sight, the presumption would be rather in favour of "pseudo-neuritis" than of true neuritis.

Speaking for myself, I have never met in "pseudo-neuritis" with those oft-recurring and transitory obscurations of sight that form so marked a feature in certain cases of optic neuritis.

(3) In true neuritis the optic disc is swollen in all its dimensions, a change that, if at all marked, reveals itself to ophthalmoscopic examination by a difference between the refraction of the disc and that of the yellow spot region of the fundus. Despite the evidence of such good observers as Harlan, R. M. Gunn,[1] W. T. Holmes Spicer, Nottbeck, and others that slight (1D. to 3D.) swelling of the disc may be present, I have never yet been able to

[1] Gunn, R. M.: *Trans. Ophthal. Society U.K.*, vol. xv, 1895, p. 136.

satisfy myself beyond peradventure that such a difference existed in "pseudo-neuritis," although to other tests, notably the appearance of the retinal vessels as they pass over the edges of the disc, the papilla appeared to be distinctly swollen. Accordingly, I am disposed to lay considerably stress upon this as a crucial diagnostic point between the two conditions. In reference to this very important matter I notice that Mr. J. Herbert Parsons, in his text-book "On Diseases of the Eye," cautions his readers not to diagnose papillitis unless at least two dioptres of swelling of the disc can actually be demonstrated.

(4) Hæmorrhages and white spots or splashes are never present in the retina around the optic disc in "pseudo-neuritis," whereas they are common in true neuritis. It is rare in the former condition for vessels to be veiled or concealed by swelling of the disc.

(5) Dilated and motionless pupils, although they may accompany true neuritis, never do the other condition. But in this connection it should be borne in mind that dilatation of a pupil is more closely connected with poor sight than with the degree of optic neuritis.

(6) In optic neuritis, as everybody knows, the visual fields usually show some peripheral

concentric contraction, particularly for colours, [1] or there may be inversion or interlacing of the boundaries for red and blue, or the field may be of hemiopic type. In "pseudo-neuritis," on the contrary, such changes are not found. In difficult cases these differences may be of considerable diagnostic value. It is a little unfortunate, however, that the tender age of many patients precludes an appeal to the point, more especially to the colour sense. Still, the visual field for white may be mapped out with fair accuracy in most children over six or seven years of age.

The exact ætiology of "pseudo-neuritis" is not known, although my own investigations have convinced me that it is a congenital condition. I have watched cases for years, but have never seen any change in the ophthalmoscopic appearances. Dr. James Bordley, [2] junr., speaks in the same sense when he says: "I have had patients under my care in whom

[1] Cushing and Bordley regard colour reversal or interlacing as constant in brain tumour. The greatest loss is almost invariably in the field for blue, so that the last named may interlace with the boundary for that of red, may be found inside the red, or less frequently may be entirely lost. Alterations in the field for colours other than blue may be seen, but their inconstancy renders them of scanty diagnostic value.—*The Ophthalmoscope*, January, 1911.

[2] *Loc. cit.*

this picture has remained unchanged for years." The anomaly may affect more than one member of the same family. For example, Nottbeck[1] found this to be the case in a brother, aged 9, and a sister aged 6 years.

Some writers seem to regard "pseudo-neuritis" as the expression of an actual hyperæmia or congestion of the optic disc due to eye-strain produced by some error of refraction, in particular by hyperopia or hyperopic astigmia. Hence the alternative name "hypermetropic disc." With this view I find myself unable to agree for two reasons. First, if "pseudo-neuritis" is caused by hyperopia, it should be relatively more frequent and certainly more pronounced in the higher than in the lower grades of that everyday condition. The figures at my disposal prove that such is not the case. Some of the most marked examples of "pseudo-neuritis" I have seen have been in association with trifling amounts of hyperopia. As Dr. H. C. Bristowe[2] has remarked: "An intense 'pseudo-neuritis' may be present with a very low degree of error," and, he might have added, without any error at all, as in the case by Spicer[3] and others. Secondly, it should undergo an improvement, or even disappear

[1] *Loc. cit.*, Cases Nos. 4 and 5. [2] *Loc. cit.*
[3] *Loc. cit.*

altogether, when eye-strain is relieved by suitable glasses, a thing that I have yet to see occur. In this view I am confirmed by so acute an observer as the late Mr. Marcus Gunn,[1] who during several years' observation of a lad, after correction of 4D. or 5D. of hyperopia, could find no influence upon the condition of the discs, which remained prominent and hyperæmic.

It is of importance to note that "pseudo-neuritis" may occur in association not only with hyperopia, but also with myopia or myopic astigmia, or even with emmetropia. If it be more frequent in hyperopia it is simply because in children that condition is at least ten times as common as the reverse condition, myopia. I may indeed claim that my personal investigations justify me in saying that in reality "pseudo-neuritis" is relatively as common in the one condition as in the other. The foregoing considerations lead me to renounce the name of the "hypermetropic disc."

In conclusion, I may say that I regard "pseudo-neuritis" as a congenital non-differentiation of the optic disc, a view supported by the frequent co-existence of shreds of connective tissue about the vessels on the papilla and also by the state of the retinal vessels.

[1] *Loc. cit.*

VI. On Cases of Eye-strain Simulating Grave Organic Disease of the Central Nervous System.[1]

In the early seventies the attention of the profession was drawn to cases of nervous disturbance, apart from mere "headache" or "neuralgia," definitely cured by correcting an error of refraction or a muscular insufficiency also of the eyes.

The pioneers in this direction were Drs. William Thomson, William F. Norris, and S. Weir Mitchell in America, and Mr. R. Brudenell Carter and Dr. J. Hughlings Jackson in England. Cases of eye-strain in which patients were believed to be suffering from some obscure affection of the brain, and on that account compelled to abandon their careers, were described by Carter[2] and Jackson[3] respectively in this country. But the wider publicity given to the curious nervous

[1] Reprinted from *The Practitioner* of December, 1912.

[2] Carter, R. B.: *Trans. Clin. Society of London*, vol. viii, 1875, p. 12.

[3] Jackson, J. H.: *Lancet*, May 12, 1877, p. 674.

concomitants of eye-strain were due to the several communications of Dr. S. Weir Mitchell, of Philadelphia, who reported cases belonging to Drs. Thomson and Norris, of the same city. One of Mitchell's[1] most striking cases occurred in a young girl who, after use of her eyes, developed headache, followed by unsteadiness of gait and a sudden sense of terror and vertigo, conditions diagnosed as due to "cerebral anæmia." Nevertheless, they all yielded to the provision of proper glasses.

In 1879 Dr. William Thomson,[2] of Philadelphia, published a noteworthy communication, "On Astigmatism as a Cause for Persistent Headache and other Nervous Symptoms," in the course of which he recounted five cases where such symptoms as vertigo, tinnitus, nausea, depression, emesis, insomnia, feelings of tension in the head, hemianopsia, and weakening or failure of mental power were relieved by glasses. Some of the cases were of a striking character. For example, one of Thomson's patients was believed to be suffering from "disease of the brain and spinal cord," and had been treated

[1] Mitchell, S. W.: *Med. and Surg. Reporter*, July 25, and August 1, 1874, and February 6, 1875.

[2] Thomson, William: *Medical News and Library*, June, 1879.

on that supposition for many years by physicians of repute both in America and on the Continent of Europe, to say nothing of irregular practitioners of every school of thought. The patient himself ascribed his symptoms to "some serious disease of the brain." Use of this patient's eyes, even for a few moments, produced numerous nervous manifestations, culminating in a "fit." Relief, known to have lasted for nine years, at once followed the use of glasses. With the onset of presbyopia, the prescription was altered to meet the changed conditions, but wrong lenses were dispensed, with a return of the old symptoms, again dissipated by rectification of the spectacles. Another of Thomson's patients was believed to be affected with "cerebral congestion," but in that instance, also, almost complete relief was obtained by the aid of suitable glasses.

These striking cases, nevertheless, failed to attract that general attention which they unquestionably deserved, and for several years little was heard on the subject of eye-strain in the pages of the medical journals. Dr. George M. Gould[1] does not hesitate to go the length of saying that these reports "were absolutely

[1] Gould, George M.: "Biographic Clinics." Philadelphia: P. Blakiston's Son and Co., 1903—1909.

and utterly ignored by the whole world." "There is not, I believe," continues Dr. Gould, "a line in medical literature, European or American, showing that they were read, certainly none that suggests that they instigated any practitioner having patients with such diseases to try the experiment of accurate correction of ametropia."

In this country, however, the silence was broken by important contributions to the doctrine of eye-strain by several authors (all, with two exceptions, ophthalmic surgeons), among whom must be mentioned H. B. Hewetson[1] (1885 and 1888); E. Clarke[2] (1892 and 1910); C. E. Pronger[3] (1903); S. Snell[4] (1904); J. Hinshelwood[5] (1906 and 1911); W. H. H. Jessop[6] (1906); L. Williams[7] (1906);

[1] Hewetson: *Medical Times and Gazette*, March 21, 1885, and *Brit. Med. Journal*, November 10, 1888.

[2] Clarke, Ernest: "Eye-strain, commonly called Asthenopia," 1892, and *Clinical Journal*, October, 1905, and March 2, 1910.

[3] Pronger, C. Ernest: "Slight Errors of Refraction and their Influence on the Nervous System," 1903.

[4] Snell, Simeon: "Eye-strain as a Cause of Headache and other Neuroses," 1904.

[5] Hinshelwood, James: *Lancet*, July 14, 1906, and February 18, 1911.

[6] Jessop, W. H. H.: *Practitioner*, July, 1906.

[7] Williams, Leonard: "Minor Maladies and their Treatment," 1906.

H. C. Mooney[1] (1907); T. P. C. Kirkpatrick[2] (1908); D. M. Mackay[3] (1909); and R. W. Doyne[4] (1910).

The great impetus to the modern recognition of the importance of eye-strain as a cause of nervous disturbance was, however, given in 1903 by Dr. George M. Gould, then of Philadelphia, U.S.A., who in that year began the publication of his now famous "Biographic Clinics." These very remarkable volumes (which number six) treat the subject of eye-strain from almost every conceivable point of view. They deal with its relationship to general health, biology, and sociology, and trace to its pernicious influence the bad health of some of the world's greatest writers, thinkers, and philosophers, as Spencer, Darwin, Carlyle, Huxley, and Taine, to name only a few of those included in Dr. Gould's lists. The case has doubtless been overstated in "Biographic Clinics"; but, say what we will on that score, Dr. Gould has brought home to us, in a way nobody else has ever succeeded in doing, the serious part played by eye-strain

[1] Mooney, Herbert C.: *Med. Press and Circular*, December 25, 1907.

[2] Kirkpatrick, T. Percy C.: *Ibid.*, January 1, 1908.

[3] Mackay, D. M.: *Practitioner*, December, 1909.

[4] Doyne, R. W.: *Brit. Med. Journal*, August 13, 1910.

and its consequences in our complex modern civilization. To his ability, enterprise, and literary skill the medical profession, in my opinion, has every reason to be deeply grateful.

In my experience, the nervous manifestations of eye-strain may assume several types, of which I shall now endeavour to characterize some of the more important :—

(1) In one group of cases the manifestations appear to be those of atypical migraine of so peculiar a type that they may be mistaken for much more serious affections of the central nervous system. H. Bendelack Hewetson[1] related such a case in a lady, aged 22, who had been unable to pursue her studies on account of racking headaches. These became constant and so severe that she was supposed to have some form of meningitis. The correction of a small amount of compound myopic astigmia completely freed her from her symptoms. Elsewhere[2] I have reported a case in point. A boy, aged 8, had been subject for six years to fits of violent and prolonged vomiting, which supervened every fortnight or so. The attacks usually

[1] Hewetson, H. Bendelack : *Medical Times and Gazette*, March 21, 1885.

[2] Stephenson, Sydney : *Medical Press and Circular*, April 18, 1906, and *Lancet*, December 17, 1910.

came on at 5 or 6 o'clock a.m., and, as a rule, lasted the whole day; although, on occasion, they had been known to persist for as long as three days. The vomiting occurred independently of food, and the vomited matter consisted mainly of "frothy, white water." On being pressed, the boy stated that the vomiting was now and then preceded by slight headache, although usually the former occurred by itself. The patient's mother, maternal grandfather, and a maternal aunt were all subject to attacks of ordinary sick-headache. The lad's sight was equal to one-half normal, and relief speedily followed the constant use of glasses.

I have seen analogous cases, in some of which I know that vomiting was replaced, after the advent of puberty, by more or less typical migraine. There are points of resemblance between these cases and the curious condition known as "cyclic vomiting" in children, believed by some to be due to acetonæmia.

I know of other cases of almost constant vertigo and slight headache cured by glasses. It is significant that all these patients suffered, in addition, from occasional attacks of more or less typical migraine; and in more than one there was a family history of a similar affection.

(2) Another striking manifestation of eye-strain is to be found in the association of intense headache, vomiting, and giddiness, apparently not in the nature of migraine. If combined with those complaints we find the edges of the optic discs ill-defined ("pseudo-neuritis"), we are at once tempted to think of the possibility of a cerebral tumour, when the symptom-complex is perhaps wholly due to uncorrected eye-strain.

The following case is typical. Mr. J. P., aged 38, came under my notice a few years ago, inasmuch as his symptoms had compelled him to abandon business, and after much ineffectual medical treatment a suspicion had arisen that his eyes might possibly be responsible for his complaints. The patient was intensely nervous and apprehensive of he knew not what. He was tormented by sleeplessness. Dyspepsia rendered life additionally miserable. On inquiry, it was ascertained that he had suffered for several months from agonizing headache of the fronto-temporal type, along with giddiness and considerable mental confusion. The headache was described as almost constant, and was associated with, but not relieved by, vomiting. The inner (nasal) edge of each optic disc was diffuse and "woolly," and the papilla, to judge

from the appearance of the retinal vessels, was œdematous, although when measured with the ophthalmoscope no actual swelling could be demonstrated. At the same time I felt it to be quite impossible to affirm, without further observation, that a slight degree of optic neuritis did not exist. There was no appreciable difference between the appearance of the two optic discs. The sight was about two-thirds normal, and became normal when the hyperopia (0·75D. sph.) was corrected. Examination of the external ocular muscles showed a vertical error of three degrees.

The grouping of symptoms in the foregoing case raised a strong suspicion that they were due to an intracranial neoplasm—although there were no localizing signs. Pending further developments, the hyperopia was corrected, and a prism of 2°d. was divided between the two eyes, and the patient was urged to wear his glasses for all purposes, From that moment his symptoms disappeared as if by magic. The patient resumed his business, and there has been no recurrence in the five years that have passed since the glasses were prescribed.

A somewhat similar case came under my notice in 1907 in the person of a gentleman, aged 38, who suffered from periodic attacks

of nausea, retching, and vertigo, lasting, with intermissions, for several hours, and sometimes followed by intense headache persisting for twenty-four hours. The attacks, which always began at night when the patient was in bed, had been present for about six years, and were getting worse when I saw the case. The patient was in a highly nervous state, incapable of work, and apprehensive of all kinds of impending misfortune. Glasses, prescribed in South Africa, had done no good. A London physician of repute had suggested that the underlying condition might be one of obscure intracranial mischief. On examination of the eyes, astigmia "against the rule" was found, with a considerable difference between the two eyes, and complete recovery of health followed the constant use of correcting lenses.

In the case to be now related, the conjunction of mental depression, headache, vomiting, vertigo, and slow pulse led to the suspicion of a nervous disease. Mr. Edward C. B., aged 27, was brought to me on September 12, 1911, by Dr. E. Y. Younger, of Mecklenburgh Square, W.C. The patient, a neuropathic subject, had not been himself for about two years, during which time he had worried about financial affairs, although, as I gathered, without much ground. For

about a month before he saw me he had been very subject to headaches, and for about a week to bouts of vomiting. He further complained of giddiness on getting up of a morning. Dr. Younger had found that his pulse-rate was from 60 to 65 per minute. On examination, vision was $\frac{6}{6}$ (partly) in each eye. There was no muscular imbalance. The optic discs were well defined and in nowise swollen, although the retinal veins struck me as being rather "full." Under atropine, the total hyperopia amounted to 1·25D.; no astigmatism. Glasses (+ 1·0D. sph.) were prescribed for constant wear, and much relief was obtained by their use during the ensuing two months. The pulse-rate, however, remained low. Then a period of strain and overwork and worry was followed by a slight recurrence of headache, not accompanied by vomiting or matutinal giddiness. The further history of the patient unfortunately is not known to me.[1]

Very remarkable was the case reported by Dr. J. A. Spalding,[2] of eye-strain in which a cerebral tumour was believed to be present, and the advisability of an osteoplastic resection

[1] Since the foregoing was written I have received a very favourable account of this patient.—S. S.

[2] Spalding: *Trans. Amer. Ophthal. Society*, vol. xi, part ii, 1907, p. 406.

of the skull was seriously discussed with a view to relieving the intracranial pressure. The grave symptoms, however, were dissipated promptly and permanently by glasses.

Equally striking was a case of mixed astigmatism, which presented many of the symptoms of brain tumour, reported only the other day by Drs. A. Brav and M. Staller,[1] of Philadelphia. The manifestations included violent headache, nausea and vomiting, vertigo, diplopia, dimness of sight, loss of memory, insomnia, mental depression and staggering when the patient, a man of 50 years, attempted to walk. When seen about two-and-a-half months after the provision of spectacles, the man was found to be free from all his former distressing and ominous symptoms.

(3) In a third group of cases, patients, who are nearly always in middle life, complain of a feeling of impending misfortune, a loss of business grip, and a pessimistic outlook on life. They are always, as it were, hovering on the brink of a so-called "nervous breakdown." Their vague headaches and uncomfortable feelings about the eyes are usually accentuated by reading or writing, even for brief periods. The sufferers, as a rule, have

[1] Brav and Staller: *New York Medical Journal*, August 26, 1911.

been strenuous men or women, with decided views upon political or other matters, and their present depression is in keeping with their former capabilities. They often hold strongly that medicine is incapable of helping them (while trying all kinds of quack remedies), and eventually tend to become melancholic.

In some of these cases the careful correction of an error of refraction will afford considerable relief, if not a veritable cure. They may or may not be spoken of as instances of "brain-fag," "neurasthenia," or "cerebral congestion"; but the point that matters to practical physicians is that some of these psychoses may be most definitely relieved by glasses. The following is a case in point: Mr. P. G., aged 43, complained that for some months he had lost all interest in his family, amusements, and surroundings, and had found his business, that of an architect, an almost intolerable burden. During the same period his eyes and head (which had never troubled him before) tended to ache as the day advanced, while giddiness often came on at night. He believed his business to be on the downward grade; although I was assured by a confidential clerk that it had never been in a more flourishing way. In this case relief was obtained soon after a vertical error of

imbalance, amounting to 4°d., had been corrected by prisms worn for all purposes. It has now lasted for upwards of four years.

In the course of a communication upon "Some Unusual Effects of Eye-strain," Dr. Wendell Reber,[1] of Philadelphia, describes the somewhat analogous case of a lady, aged 25, troubled almost constantly with occipital headache, intensified after use of the eyes on near objects and after shopping or riding in the street cars. Vertigo and nausea were present, and the patient "felt as though her head would burst." She was morose and depressed, and had often feared that she was losing her mental balance. The correction of one dioptre of hyperopia, together with 0·12 dioptre of astigmia, by glasses led to the disappearance of all her symptoms, and within six months she had gained eighteen pounds in weight.

In discussing this case and the others he describes, Dr. Reber remarks: "To the general profession and to the lay mind it will need much iteration and reiteration to bring about a belief in the postulate, for instance, that a cervico-brachial neuralgia could be symptomatic of eye-strain; that riding in tramcars was simply impossible to a patient

[1] Reber, Wendell: *The Ophthalmoscope*, 1910, p.880.

because of eye-strain ; that mental depression, intellectual confusion, and entire change of the view-point of one's life could follow upon so seemingly small a cause."

(4) In a small group of cases we find that eye-strain may produce such curious nervous symptoms as to preclude anything like a child's continuous education. One such case I have reported elsewhere,[1] but as it is characteristic of the group, I may perhaps be allowed to repeat the main facts in this place :—

A girl, aged 12, the daughter of a medical man, was brought to me on September 22, 1900, complaining that use of the eyes for more than a few minutes brought on pain in the eyes and in the frontal region. It appeared from the history that a brief attendance at school always caused the child to get white, to lose flesh, and to impair her health. In a word, it induced the manifestations of a "nervous breakdown." These repeated attacks led the parents to send the girl, when 10 years of age, to Tasmania. On the voyage the patient put on flesh and seemed healthy in every way, but when sent to a school soon after reaching Tasmania all her former symptoms reappeared. A change to the

[1] Stephenson, Sydney : *Medical Press and Circular*, February 4 and 11, 1903.

mountains in the colony was tried but without success. Finally, after staying for about a year in Tasmania, she returned to England. Another ophthalmic surgeon, who examined the child just before I did so, stated that the eyes were not at fault, or, rather, that so little was the matter with them that there was no necessity for interfering. Upon examination, I found the sight almost normal. There was slight exophoria (1·5d. prism). Under atropine, slight compound hyperoptic astigmia was found, with asymmetrical and oblique direction of the axes of the cylinders. Symptoms were immediately relieved by the glasses, and the girl was able to attend school like any ordinary child.

The next case is even more striking. Master Brian S., aged $8\frac{1}{2}$, was brought to me in 1903 because he was affected almost every day with severe frontal headaches, induced by employing his eyes on near objects. Furthermore, he had been observed to blink frequently, and had complained of slight aching of his eyes. Dr. Frank Deas, of Merton Park, S.W., who referred the patient to me, informed me that he came of "a very neurotic family." The correction of mixed astigmatism by glasses cured the headache, &c. Two years later (1905) there was a re-

currence of the symptoms, and it was then discovered that he had lost his glasses, which had been replaced by another pair, obtained from a West End optician, not in agreement with the prescription given two years before. Rectification of the glasses speedily led to disappearance of the symptoms. Nothing more was seen of the lad for upwards of five years (1910), when he was 16 years of age. His general condition had caused considerable anxiety to his parents for some weeks. His character had changed from that of a bright boy to a morose youth subject to fits of depression and prostration lasting whole days at a time. He had severe headaches, which persisted for three or four hours or longer, and which came on three days a week. For three or four weeks he had complained of nausea and (what was more alarming to the parents) of violent internal pains after food. A London physician, who was consulted, diagnosed appendicitis, and the advisability of an operation was even discussed. Anyhow, rest and absence from school were enjoined, and the parents were advised that eventually an agricultural life in Canada was indicated. I ventured to suggest that the state of his eyes might be responsible for his general condition, and my suggestion was fully justified

by the outcome of the case. On examination of the eyes under atropine, it was found that the mixed astigmatism in the right eye had diminished, while in the left it had been replaced by simple myopic astigmatism, with oblique meridians. Fully correcting spectacles were prescribed for constant wear and when seen two months later the patient had lost all his complaints and had once more become a bright and animated lad. I heard only the other day (October, 1912) that he was lively and happy, had had no return of the headaches, and was about to enter for an examination as a chartered accountant.

On referring to the literature I find that the foregoing is not the first case where the manifestations of eye-strain have been mistaken for those of appendicitis. Thus, Dr. George M. Gould[1] quotes a letter he received from an oculist in which occurs the following passage : " You will be interested to know that I have just heard from a patient who had been suffering from abdominal cramps supposed to indicate appendicitis, who had mixed astigmatism as determined by a local oculist to whom his physician referred him rather than have him remain in Philadelphia ; that

[1] Gould, George M. : " Biographic Clinics," vol. iv, 1906, p. 22.

he has had no pain whatever since he has become accustomed to his glasses." Again, Dr. Ellice M. Alger,[1] of Philadelphia, has reported the case of a male patient, aged 19, who was affected with attacks of abdominal pain, which usually occurred two or three hours after meals. "Chronic appendicitis" was the diagnosis of the first surgeon consulted, and "cholelithiasis" of the second. Operation was advised by both. A third surgeon, Dr. Robert T. Morris, however, diagnosed eye-strain, and urged examination of the eyes. Glasses for constant wear led to a disappearance of the symptoms for nearly three years, when the original glasses having been lost, another pair was given by a firm of advertising opticians. All the symptoms recurred. The painful attacks were finally dissipated by glasses prescribed by Dr. Alger. The underlying ocular condition was + 0·75D., cylinder axis vertical. It is of practical interest to note that this patient did not suffer from headache or eye-pain, and that his sight was normal in each eye without glasses.

Conditions such as those described above are, of course, wholly different from cases where the education of children is brought to

[1] Alger, Ellice M.: *New York Medical Journal*, June 8, 1907, p. 1078.

a standstill, or, more correctly, never commenced at all, owing to gross errors of refraction. These instances of "artificial stupidity" have been commented upon by several writers. Not long since Dr. Marcus Bowlan[1] recorded the case of a girl, aged 8, who had been refused at school as an idiot. She had been attending a special school for weak-minded children, where she was declared incapable of receiving further instruction. She was admitted to hospital as affected with "mental hebetude," with a view to being sent to an idiot asylum. But this unfortunate girl was only suffering from hyperopic astigmia, and when her refraction had been corrected, she could count $\frac{1}{5}$-in. dots at 20 ft. After being provided with spectacles, she was sent home instead of to an idiot asylum.

(5) That eye-strain may on occasion give rise to symptoms suggestive of acute mental derangement is attested by a case mentioned by Dr. T. Percy C. Kirkpatrick.[2] Dr. Kirkpatrick was called in a hurry to attend a gentleman, believed to be going off his head, who had threatened to commit suicide. The patient was restless and excited, complaining

[1] Bowlan, Marcus: *Lancet*, December 31, 1910.

[2] Kirkpatrick, T. Percy C.: *Medical Press and Circular*, January 1, 1908.

of severe headache, and saying that at times he felt quite unable to control his actions. He was removed to a private hospital, placed at complete rest, and treated by bromides. A suggestion that his eyes might be at fault was indignantly repudiated by the patient. Nevertheless, a change of glasses resulted in such freedom from headaches and improvement in his general health as had been unknown to the patient for fifteen years.

(6) In reference to this question Dr. Samuel D. Risley,[1] of Philadelphia, has recently directed attention to a group of cases where asthenopia is associated with the distress or alienation peculiar to the disordered mind. He gives particulars of four such patients in whom the symptoms, which ranged from mental delusions and hallucinations, on the one hand, to weakening of mental grasp or the fear of loss of mental control, on the other, were relieved by lenses or prisms, or by the performance of an operation on the external muscles of the eye. One of his patients, a lady, aged 32, had been an inmate of an asylum for two years, and when her eyes were examined by Risley was classed among the incurably insane. Soon after receiving glasses which corrected her hyperopic astigmia, she was allowed

[1] Risley, Samuel D.: *Ophthalmic Record*, 1910, p. 144.

to go home. During the nineteen years thereafter she remained under observation there was no return of the delusions that had "made the asylum for the insane her only safe home."

In each of Risley's patients, besides an error of refraction, unequal as between the two eyes, there was an inability to maintain single binocular vision except at the expense of a constant muscular strain. Hysterical stigmata, if present at all, were very obscure. The personal or family history pointed quite definitely to some inherent nervous instability as present in each of the patients.

VII. On the Aftermath of Eye-strain.[1]

Being the Richard Middlemore Post-Graduate Lecture, delivered on December 1, 1910, *at the Birmingham and Midland Eye Hospital.*

Among the minor ills of life few occupy a more important place than those which arise from eye-strain. Many a headache, many an attack of giddiness, many an instance of "brain-fag," and many a so-called "nervous breakdown" tell only too surely of an unsuspected error of refraction, or of subnormal accommodation, or of a muscular imperfection of the eyes, all of which may be relieved by suitable spectacles. These cases come in the first instance under the notice of the family medical adviser rather than of the ophthalmic surgeon. It is therefore a matter of no little consequence for him to be acquainted with the peculiarities of eye-strain, so that patients may be freed from their discomfort in the speediest possible way. What I have to say will not deal with those physical peculiarities of the eye which give rise to the several conditions known as hyperopia, myopia, or astigmia. They have been made the subject

[1] Republished from *The Lancet* of December 17, 1910.

of a former Middlemore Lecture by Mr. Henry Eales.[1] On the contrary, my remarks will deal with the several conditions known or believed to result from eye-strain, and in describing them I shall touch upon the evidence on which our knowledge is based.

General Remarks.

(1) *How to recognize Symptomatic Eye-strain.* — Whenever a headache, migraine, "neuralgia," vertigo, "tic," or other symptom is induced or made worse by use of the eyes and relieved by rest, we may safely assume it is due to eye-strain. That supposition is strengthened (paradoxical though it may seem) if the patient possesses sight which, when estimated by the test-types, is found to be normal or supernormal. It is a suspicious circumstance if headache is complained of after a visit to a theatre or a picture gallery, or a journey by train, tram, or car. There is more than the proverbial grain of truth in the epigram of an American physician who remarked that there was nothing particularly characteristic about the headache of eye-strain, except that the subject rarely suspected that his eyes were at fault. This point

[1] Eales, Henry: *Birmingham Medical Review*, 1891, vol. xxix.

has been emphasized anew by Dr. James Hinshelwood, of Glasgow.[1] Then there is the fact that an ocular reflex can often be inhibited for the time being by putting a drop of atropine (or other cycloplegic) into the patient's eyes. Lastly, it can scarcely be repeated too often that no eye can be pronounced to be normal unless its refraction has been estimated by a competent surgeon under the influence of a cycloplegic.

(2) *The Kind of Patient.*—Slight errors of refraction are more likely to cause distress in persons who have inherited or acquired an unstable nervous system, the "neuropathic" disposition, as Dr. George T. Stevens called it.[2] In my opinion, this factor dominates the entire question of eye-strain, especially in its severer manifestations. Women and children suffer more readily than men, among whom the highly-strung are the more liable. The higher classes are more prone than the lower; the cultured than the uncultured. Clerks, teachers, stenographers, dressmakers, typewriters, students, and others compelled by occupation to use the eyes for hours at a time, are particularly

[1] Hinshelwood, James: *The Lancet*, July 14, 1906, p. 78.

[2] Stevens, George T.: "Functional Nervous Diseases," New York, 1887.

subject to the symptoms of eye-strain. The general health of the patient is by no means devoid of influence. It is clear that an error of refraction or of muscular balance is more likely to cause distress if the patient is in poor health, as from influenza, or debilitated, as from lactation or recent confinement. It is not uncommon for the trouble to disclose itself for the first time under such circumstances, even although the underlying ocular defect may have existed from childhood or even have been congenital.

(3) *How Eye-strain shows itself.* — By common consent, headache is the commonest reflex manifestation of eye-strain. It has been estimated that headaches of ocular origin form from 80 per cent. to 90 per cent. of all cases of headache (Sir T. Lauder Brunton). In an analysis of 106 instances of reflex neuroses probably due to the eyes, Dr. H. B. Ellis[1] found that headache was present in 87·7 per cent., digestive and assimilative disorders in 5·7 per cent., blind spells in 3·8 per cent., mental symptoms, loss of memory, &c., in 1·9 per cent., and insomnia in 0·9 per cent. The late Mr. Simeon Snell[2] found that

[1] Ellis, H. B.: *New York Medical Journal*, April 30, 1892.

[2] Snell, Simeon: "Eye-strain as a Cause of Headache and other Neuroses," London, 1904, p. 30.

of 800 consecutive refraction cases that came under his notice, 162—that is, about 1 in every 5—sought advice in consequence of headache.

(4) *The Kind and Magnitude of the Error.*—Of all errors of refraction, slight grades of hyperopia, and particularly of hyperopic astigmia, are those most likely to cause distress. The tendency is greatly increased if the error be asymmetrical as regards the axis of the cylinder or be unequal in the two eyes. On the other hand, myopic defects usually produce poor sight rather than the common reflex manifestations of eye-strain, such as aching eyes or head.

The results of strain are more likely to occur when the underlying error of refraction is so small that it can be mastered for the time being by action of the ciliary muscle. To put the matter in another way, a large error of refraction, which cannot be overcome by those means, leads, as a rule, to defective sight and not to eye-strain. "The smaller the error," it has been aptly said,[1] "the more likely is eye-strain to be present, and also, unfortunately for the patient, the more likely is it to be overlooked."

[1] Clarke, Ernest: *Clinical Journal*, March 2, 1910.

Patients with eye-strain, then, seldom show any serious departure from normal when their relative visual acuity is estimated at Snellen's test-types, an important point for the examining physician to bear in mind.

(5) *Method of estimating the Error.*—The days are fairly outlived when it was seriously taught that an astigmatism of less than 1·0D., provided it caused no interference with sight, might be safely disregarded. It is now recognized that, under some conditions, an amount of astigmatism of no more than 0·25D., or even 0·12D., may cause intense discomfort. For the detection of such small errors the means of examination can scarcely be too accurate. It goes without saying that the surgeon himself must be well versed in refraction work. He must be equipped with suitable lenses, correctly designed trial-frames, and properly illuminated and drawn test-types, and he should be expert in the use of the retinoscope and of other instruments of precision, such as the keratometer. Everything hinges upon exactitude. "It is the little, the inconsiderable thing, in refraction work upon which the relief of the reflexes depends."[1]

The precise determination of ametropia,

[1] Gould, George M.: "Biographic Clinics," vol. ii, p. 361, 1904.

especially the low degrees of ametropia, is not possible, I believe, unless the eyes be under the influence of some agent, as homatropine, hyoscin, or atropine, which is capable of paralysing the ciliary muscle, a cycloplegic in fact. In no other way, to my thinking, can the full measure of the defect be disclosed. In young persons, indeed, the accommodation is so active that it may conceal a hyperopia of several diopters, to say nothing of a considerable degree of astigmia. To a certain extent the remark is true of older patients also. Not only must the cycloplegic be of the right kind, but it must be applied until accommodation is placed wholly in abeyance, a point that should always be ascertained by means of a suitable test. Speaking generally, the most trustworthy results are obtained when the selected drug is applied to the eyes by the surgeon himself.

Special Remarks.

The ground having so far been cleared, we may now pass forward to consider in some detail those symptoms, general and local, which may result from eye-strain.

Although astigmatism was described more

than a hundred years ago by Thomas Young,[1] yet our knowledge of its pathological significance dates only from 1874, when Dr. S. Weir Mitchell,[2] of Philadelphia, published a remarkable article on the subject. Dr. Mitchell minimized the influence of rheumatism as a cause of headache and denied that of gout altogether. In particular, he directed attention to the headache of unsuspected eye-strain. He pointed out that "headaches come with many intra-ocular disorders, but neither in the books on the eye nor elsewhere is it made plain that headaches may be for years almost the sole symptom of grave disorders of accommodation, or of defect in the orderly action of the external eye-muscles." In cases of chronic headache Dr. Weir Mitchell[3] insisted upon the necessity of "a careful study of the eye," and thereby laid future generations under a heavy debt of gratitude. In the following year Dr. Mitchell published his well-known "Notes on Headaches," in which he drew attention to the influence of illness, worry, anxiety, and so forth, in converting a latent defect of the eyes into one that produced

[1] Young, Thomas: *Philosophical Transactions*, 1793, p. 169.

[2] Mitchell, S. Weir: *Medical and Surgical Reporter*, July 25 and August 1, 1874.

[3] *Ibid.*, February 6, 1875.

active symptoms, as shown by headache and a sense of strain. About the same time as Dr. Mitchell's second paper was published an extraordinary case (which has since become almost classic) was brought before the Clinical Society of London by Mr. R. Brudenell Carter.[1] An undergraduate, whilst reading for honours, was suddenly attacked with diplopia, vertigo, headache, sickness, and palpitation of the heart, which were attributed to some obscure affection of the brain, a diagnosis confirmed by physicians both at the University and in London. The patient was sent on a voyage to Australia, but came home no better. He was then told that he must give up all hope of succeeding to his father's business and abandon a marriage engagement to which he was committed. His prospects in life were blighted, and his despondency was commensurate with his misfortunes. Mr. Carter found this unfortunate young man to be short-sighted to the extent of 4·5D., and after suitable spectacles were prescribed all symptoms disappeared. It is satisfactory to add that when last heard of the patient was about to engage both in business and in matrimony.

[1] Carter, R. Brudenell: *Transactions of the Clinical Society of London*, vol. viii, 1875, p. 12.

A very suggestive case was reported by Dr. Weir Mitchell[1] in 1876. A girl, aged 16, suffered from headache, induced by use of the eyes, for several days after each of her periods, and at a later stage she developed an occasional unsteadiness of gait, together with a sudden sense of terror and vertigo. Her rest was broken and disturbed by dreams. By the aid of the ophthalmoscope, a condition of "cerebral anæmia" was diagnosed. Under the use of glasses, the vertigo at first grew worse, but soon it and the headache and insomnia passed away, so that in a month she was able to read, sew, and write for hours at a time.

In an oration delivered before the Medical Society of London in 1877 Dr. J. Hughlings Jackson[2] spoke of cases of abnormal refraction simulating brain disease, and he instanced the case of a medical student, aged 21, who had been obliged to give up his work because it brought on attacks of frontal headache and vomiting. To ordinary examination, vision appeared to be good, but on remedying the hyperopic astigmia, discovered on more com-

[1] Mitchell, Weir: *American Journal of the Medical Sciences*, vol. lxxi, 1876, p. 363.

[2] Jackson, J. Hughlings: *The Lancet*, May 12, 1877, p. 674.

plete examination, the patient was enabled to return to his work and to graduate at the University of London. He had remained well up to the time Dr. Jackson wrote, a period of two years.

These communications drew the attention of the medical profession to the fact that headache was a common manifestation of overtaxed eyes, and that it might be accompanied by even more ominous symptoms. This enlightenment means a good deal, for, truth to say, many a member of the public goes direct to the ophthalmic surgeon when he finds that use of the eyes tends to make his head uncomfortable.

The functional headache of eye-strain is commoner than is generally thought. Pain may be present in almost any degree of severity, but is apt to be described by patients as a "dull aching," with paroxysms of more acute suffering from time to time. Although there is no characteristic position, yet the commonest site of ocular pain is over the brow and, next to that, in the temple. Occipital, vertical, and general headaches are by no means unknown as the direct consequence of strain upon the eyes. The cephalagia is often associated with pain at the back of the eyes, which are apt to be tender. As a rule, both eyes suffer equally

unless there be a marked difference in the refraction, when in common experience discomfort is usually worse on the side of the better eye. Apart from actual pain, the eyes may feel heavy, tired, or become red after use, or there may be complaints that they throb, burn, or water. A sign almost conclusive of eye-strain is the existence of slightly reddened eyelids, about the lashes of which are to be seen a number of fine branny scales. Whenever this condition (sometimes called "ametropic blepharitis") is seen we should at once think of asthenopia. An outbreak of small styes, too, is often a guide to the existence of eye-strain, and so is frequent blinking, with or without slight facial contortions, liable to be mistaken for chorea, of which something will be said later.

Apart from these considerations, the cardinal diagnostic point is that pain, whatever its exact site and nature, is brought on (or, at least, rendered worse) by using the eyes, it may be, for reading or, especially in the case of muscular errors, for distance.

That those who suffer from ocular headache sometimes suffer also from disordered general health can scarcely be looked upon as extraordinary. Such complaints as insomnia, confusion of thought, inability to fix the attention,

irritability of temper, and gastric disturbance are not rare, and those symptoms, like the headache, may often be relieved by suitable glasses.

Insomnia was cited a good many years ago as a symptom of astigmatism by Mr. H. B. Hewetson, of Leeds.[1] He quoted a case where the eyes had given much trouble during the examinational period of an Oxford man's life. After astigmatism was corrected with glasses, with an equal amount of work, the insomnia disappeared, and the whole physical and nervous state of the patient improved greatly. Dr. Ambrose L. Ranney,[2] an American physician with leanings towards ophthalmology, has quoted illustrative cases, some of a striking nature. The late Mr. Simeon Snell[3] spoke of insomnia as a frequent manifestation of eye-strain, and commented upon the fact that natural sleep speedily returned when relief had been afforded to the over-taxed eyes by correcting glasses. Dr. James Hinshelwood[4] says that eye-strain

[1] Hewetson, H. B.: *British Medical Journal*, November 10, 1888.

[2] Ranney, Ambrose L.: *New York Medical Journal*, March 28, 1891, and June 11, 1892.

[3] Snell, Simeon: "Eye-strain as a Cause of Headache and other Neuroses," London, 1904.

[4] Hinshelwood, James: *The Lancet*, February 18, 1911.

should always be thought of as a possible cause in all patients with insomnia who use the eyes much. He has seen several distressing cases relieved by the provision of suitable glasses. Indeed, cases of this sort must be familiar to every ophthalmic surgeon, and I have myself notes of quite a number.

A similar remark applies to irritability of temper, confusion of thought, and nausea after use of the eyes. It is sometimes astonishing to see the improvement in temper and general health and "nervousness" that follows the correction of even low degrees of hyperopic astigmia, especially in children.

I may say that, in my opinion, a physician who attempts to treat a patient for chronic headache without first making a careful examination of the eyes fails in an elementary duty.

That migraine is often closely associated with ocular defects is no new observation, since the connection was recognized by Piorry[1] seventy-five years ago, and since then has been commented on by many writers, including Airy, Liveing, Ranney, Hewetson, Lauder Brunton, Stevens, Gould, Clarke, and Snell.

[1] Piorry (quoted by E. Liveing): "On Megrim, Sick Headache and Some Allied Disorders," London, 1873, p. 54.

Indeed, in 1882 Dr. Savage,[1] of Jackson, U.S.A., announced that he had discovered the "real cause" (*sic*) of sick-headache to be hypermetropia and astigmatism, and consequently that its successful treatment lay in the use of proper glasses. A few years later our own countryman, Mr. H. B. Hewetson,[2] laid stress upon the fact that correction of the eyes by cylindrical glasses relieved not only the headache, but also the intermediate dyspepsia, insomnia, and irritability of temper liable to occur in some patients between the attacks of megrim. In the following year Dr. Ambrose L. Ranney[3] stated that "the symptoms of sick-headache are reflex in character to a large extent, and due primarily, in almost every case, to some optical defect"; and, again,[4] in 1892 he said that he had yet to encounter a typical sick-headache not associated with eye-strain.

Nowadays, few would probably care to go quite so far in their statements as Drs. Savage and Ranney, although every experienced ophthalmic surgeon knows that many cases of

[1] Savage: *Medical and Surgical Reporter*, July 29, 1882.

[2] Hewetson, H. B.: *Medical Times and Gazette*, March 21, 1885.

[3] Ranney, Ambrose L.: *New York Medical Journal*, February 27, 1886.

[4] *Ibid.*, June 18, 1892.

migraine are closely connected with eye-strain. Speaking for myself, I could quote case after case of the relief or cure of migraine by the use of spectacles, but I shall content myself by placing on record my conviction that, as a matter of routine practice, the eyes should be examined in every case of sick-headache. In children it appears that migraine may be replaced by bouts of vomiting, as I have pointed out elsewhere,[1] and that some of these cases yield to the correction of associated ametropia. The following is a case in point. A boy, aged 8, had been subject for six years to fits of violent and prolonged vomiting, which came on every fortnight or so. The attacks generally supervened at 5 or 6 o'clock a.m., and lasted, as a rule, the entire day, but on occasion they had been known to persist for as long as three days. The emesis occurred independently of food, and the vomited matters consisted mainly of "frothy, white water." On close questioning, the lad stated that now and then the vomiting was preceded by headache, although usually the former occurred alone. The patient's mother, maternal grandfather, and a maternal aunt all suffered from ordinary sick-headache. The lad's sight was equal to

[1] Stephenson, Sydney: *Medical Press and Circular*, April 18, 1906.

one-half normal, and relief followed the constant use of correcting glasses.

In some of these patients vomiting is replaced, after the advent of puberty, by migraine of a more or less typical description. What connection, if any, such cases have with the curious condition known as "cyclic vomiting" in children, believed by some to be due to acetonæmia, would be an interesting subject for inquiry. There are certainly points of resemblance between the two.

Vertigo as a consequence of eye-strain is a symptom that is more likely to take a patient in the first instance to a general physician than to an ophthalmic surgeon. That it occurs is undoubted. It appears to be more common in women than in men. I can recall some striking instances of its cure by the correction of astigmia and especially of vertical deviations of the eyeball, hyperphoria. Thus, a gentleman occupying an important judicial position was so tormented with giddiness that he entertained serious thoughts of resigning his office. The symptom was entirely relieved by correcting the hyperopic astigmia and anisometropia from which he suffered. Mr. C. E. Pronger[1] mentions a very similar case. The patient developed

[1] Quoted by George M. Gould: "Biographic Clinics," vol. iii, 1905, p. 191.

curious attacks of giddiness which came on when awakening from sleep and produced an unconscious condition that lasted for about fifteen minutes, and which was followed by a violent headache. Bromides, suggested by a London specialist, availed nothing. The result of glasses, however, was most satisfactory.

Most of the remaining effects of uncompensated eye-strain may be grouped as neuroses —that is to say, as nervous affections of a functional nature. One phase of the functional neurosis known as "habit-spasm" is commonly caused by ocular strain. It is liable to be confused with chorea, a point that doubtless accounts for some of the cases of so-called "chorea" stated to have been cured by glasses. Habit-spasm occurs chiefly in sparse and nervous children from 5 to 12 years, and usually shows itself by jerking movements of the eye-lids, often accompanied by a drawing-up of the angle of the mouth. Less frequent symptoms are a trick of suddenly turning the eyes upwards or downwards, or of closing one eye. These signs often make up the sum total of the ailment, but there may be convulsive movements of the tip of the nose, the forehead, shoulders, arms, hands, or legs, or a tendency to make uncouth noises. In many cases, more especially those in which blinking is the chief

symptom, the correction of even a trifling error of refraction will check the "tic," as the condition is sometimes called. Atropine dropped into the eyes has sometimes the same effect. Elsewhere[1] I have reported a series of these cases, and in doing so, I laid stress upon four points, which I venture to repeat in this place. They are as follows: (1) Such children seldom complain of eye-strain, an omission that is likely to mislead the practitioner; (2) their sight is usually good; (3) no dependence whatever should be attached to an estimation of refraction unless the eyes at the moment of examination are fully under the influence of atropine; and (4) the ametropia should be corrected almost fully by glasses to be worn for every purpose.

The following case appears to support the claim recently made by Mr. R. W. Doyne,[2] namely, that polyuria may be a manifestation of eye-strain. A thin and nervous man, aged 35, consulted me on account of painful eyes, which when bad were accompanied by nausea and followed by the passage of large amounts of pale urine. The condition had been present for five or six years. The full

[1] Stephenson, Sydney: *British Medical Journal*, September 18, 1909, p. 751.

[2] Doyne, R. W.: *British Medical Journal*, August 13, 1910

correction of compound myopic astigmatism (— 1·0D. sph. with — 1·5D. cyl. axis 80°) by spectacles for constant wear was speedily followed by loss of the headache and eventually of the polyuria. The patient himself was convinced that the glasses were responsible for his cure, although it is obviously impossible to exclude the influence of suggestion.

When we come to epilepsy and its relationship to eye-strain we enter upon debatable ground. That the characteristic convulsions may result from abnormal conditions of the eye has been warmly affirmed and as hotly denied. Although I can make no personal contribution to the discussion, I can at least briefly describe the experiences of some other observers and ask my hearers to draw their own conclusions as to the reality of the connection.

In 1887 Dr. Stevens and Dr. Ranney reported cases of epilepsy cured by glasses or by operations upon the external eye muscles. Somewhat later Dr. Wendell Reber,[1] of Philadelphia, described several instances of the same disease cured by glasses. Dr. George M. Gould[2] gave particulars of six such patients cured by glasses, and other

[1] Reber, Wendell: *Pennsylvania State Journal*, 1902.

[2] Gould, George M.: *American Medicine*, July 15, 1902; *Journal of Mental and Nervous Diseases*, November, 1889.

American writers, as G. H. Thomas, Samuel Theobald, Myles Standish, Zimmerman, Gallaher, Semple, and Hubbell, have reported that, in their experience, epileptic attacks are either cured or reduced in number by the provision of proper glasses.

Opposing evidence was furnished by the Commission appointed in 1887 by the New York Neurological Society to examine the claim made by Dr. George T. Stevens—namely, that ocular disturbances were "among the most prolific sources of nervous disturbances, and more frequently than other conditions constitute a neuropathic tendency." After having investigated nine test cases, the Commission reported that no single instance could be cited in which the cure of genuine epilepsy had followed correction of refractive or muscular errors of the eye. Of the cases, three were improved, five remained without improvement, and, finally, in one the result was unknown. In view of these facts, the Commission expressed the view that the method did not afford a sufficient degree of relief to patients to warrant its adoption or recommendation as a means of cure or as the sole therapeutic measure. Dr. Stevens[1]

[1] Stevens: *Journal of Mental and Nervous Diseases*, 1889, p. 690.

replied by alleging bad faith on the part of the Commission, which, be it noted, in addition to himself, included two members of his own nomination. He furthermore spoke of the report as "*ex parte* and objectionable in spirit and motive." Dr. Gould[1] dismisses the findings of the Stevens Commission with these contemptuous words: "One may summarize the results of this Commission as being, perhaps, as worthless as the reports criticized."

Dr. William P. Spratling[2] has given an account of experiments carried out at the Craig Colony of Epileptics, Sonyea, New York, an institution of which he is the medical superintendent. Sixty-eight patients (mostly young or middle-aged adults) were selected for experiment—a number that included 35 men and 33 women. Attacks were tabulated for a period of three months previous to the use of correcting glasses, and, again, for periods of three, six, and twelve months after their employment. The ocular examinations (conducted under homatropine and cocaine) were carried out by Dr. George M. Gould, assisted

[1] Gould, George M.: "Biographic Clinics," vol. iv, 1906, p. 355.

[2] Spratling, William P.: *American Medicine*, April 9, 1904.

by Dr. Arthur J. Bennett, of Buffalo. The glasses were prescribed by Dr. Gould, and with few exceptions, were worn from September 1, 1902, to September 1, 1903. The results obtained in 66 of the cases were as follows: (1) In one case there was an arrest of the attacks and cure seemed probable[1]; (2) in 11 cases there was an apparent decrease in the attacks; (3) in 16 cases there was no change; and (4) in 33 cases the attacks increased.

The validity of the Craig Colony experiment has been challenged by Dr. Gould, who speaks of "the confused and untrustworthy statistics of the official report," and criticizes the absence of a resident oculist or optician to supervise the after-treatment of the cases. To quote his own curious words, Dr. Gould thinks he should have excluded from the list "the old hopeless patients, those on the verge of the grave, and hence incapable of convulsions after death."

A bit of interesting evidence has been furnished by Drs. Hodskin and Moore,[2] who kept the eyes of eighty-eight epileptics

[1] According to a later communication by Dr. Spratling (*New York Medical Journal*, September 16, 1905) the seizures in this patient recurred.

[2] Hodskin and Moore: *Journal of Ophthalmology and Oto-Laryngology*, May, 1908.

under the influence of atropine for a month. For the atropine month the seizures averaged 12·6 per patient, as compared with 13·2 for the average month. The authors firmly "believe that the rôle played by ocular defects in the causation of epilepsy is a very modest one." Finally, Dr. B. Sachs[1] does not know "of a single case in which epileptiform seizures have been altogether inhibited or even diminished in number by the wearing of glasses, by the cutting of muscles, or by any other ocular measures which have been adopted."

In our own country the ocular origin of some cases of epilepsy has been endorsed by several writers. To Mr. H. Work Dodd[2] we are indebted for a most important contribution dealing with the treatment by glasses of one hundred consecutive cases of epilepsy at the West End Hospital for Nervous Diseases and Paralysis, London. All but three of the patients were examined with the eyes under the influence of a cycloplegic (atropine or homatropine). Into the carefully tabulated results we need not enter here. It is of more importance for our present purpose to note that fifty-two of the patients were ordered to wear glasses, and of that number thirteen

[1] Sachs, B.: *Medical News*, July 30, 1904.

[2] Dodd, H. Work: *Brain*, xvi, 1893, p. 534.

developed no fits during periods that varied from four to twelve months. In thirty-six other patients the condition was improved under glasses, and three patients remained *in statu quo.* In reference to these somewhat striking figures, it is to be remarked that the usual medical treatment appears to have been continued in all the cases.

Mr. C. Ernest Pronger[1] makes the statement that in true epilepsy and in *petit mal* "some error of refraction is very commonly present, and that the correction of it tends unmistakably in my opinion to mitigate both the intensity and frequency of the attacks." This view amounts to little more than a pious expression of opinion and appears to call for no comment. But Mr. N. Bishop Harman[2] relates the case of a young lady subject to fits which "tallied well with the picture of epilepsy, save in one point—that consciousness was not lost," who experienced no further attacks after glasses had been prescribed for the hyperopic astigmia and anisometropia that were present in the case. It is singularly unfortunate that in Mr. Harman's patient one essential of epilepsy—namely, loss

[1] Pronger, C. Ernest: "Slight Errors of Refraction and their Influence on the Nervous System," Harrogate, 1903.

[2] Harman, N. Bishop: *Medical Press and Circular,* November 18, 1903.

of consciousness—was absent. Finally, Mr. Ernest Clarke[1] takes up the position that "the removal of eye-strain does not, in the strict sense of the word, cure epilepsy any more than it cures a headache, but by removing the eye-strain we remove one of the causes, and frequently the only cause, that determines an attack." Few will be found to join issue with Mr. Clarke's eminently reasonable proposition.

All things considered, I cannot help thinking that there is a case for further investigation into the relationship between eye-strain and epilepsy. In any such investigation it is to be hoped that three precautions will be adopted: (1) to make sure that the disease is true epilepsy and not a mere hysteroid convulsion; (2) to treat the patient by glasses alone; and (3) to observe the case not for weeks, but for years.

In his famous "Biographic Clinics" Dr. George M. Gould has shown with more or less likelihood that the "irritability," "nervousness," and general ill-health of some of our greatest writers and thinkers was the functional result of undetected eye-strain. Dr. Gould's list includes such names as those of De Quincey, Carlyle, Darwin, Huxley, Taine, Browning, Wagner, Balzac, Whittier,

[1] Clarke, Ernest: *Clinical Journal*, March 2, 1910.

Flaubert, Spencer, Hearn, Tschaikovsky, and Nietzsche. It cannot, indeed, be doubted that in some neuropathic individuals (the class from which great writers are mainly recruited) the eyes are accountable for a host of troubles, which range from "nervous breakdown," mental apprehension, and agoraphobia, on the one hand, to the manifestations of neurasthenia or of actual mental disorder, on the other. At the same time such cases (which are far from common in my experience) occur only in nervous, highly strung individuals. Dr. Samuel D. Risley[1] has recently pointed out that the ocular defects present in these psychoses are precisely those which are frequent in other patients, and he has laid particular stress on the fact that for the production of the symptoms another factor is essential—namely, an unstable nervous system, inherited or acquired. Again, there is always the influence of "suggestion" to be thought of. It is certain that an ophthalmic surgeon deeply imbued with a belief in the efficacy of glasses will do more with this particular class of patient than his equally competent brother whose enthusiasm is perchance tinctured with a calmer judgment. Indeed, all things are

[1] Risley, Samuel D.: *Pennsylvania Medical Journal*, February, 1910.

possible to the eye of faith. But the hard fact remains that relief can be given to a certain number of these patients by careful attention to the eyes, a point that, in my opinion, merits more attention from practising physicians than it has yet received, especially in this country and on the continent of Europe.

An example of a minor psychosis due to the eyes is well exemplified in a case related by Sir T. Lauder Brunton.[1] A patient consulted that distinguished physician complaining that he was losing his head. He had a large business, and whenever he sat down to his account books he could manage pretty well for five minutes, and then (he said) everything seemed to go round and he could not add two and two together. This patient's eyes were presbyopic, and his symptoms speedily yielded to a pair of spectacles. A case recently published by Dr. Wendell Reber[2] is even more striking. A girl, aged 25, suffered from dull occipital headache, and after reading and sewing, from vertigo and nausea, with a

[1] Brunton, Sir T. Lauder: *The Practitioner*, February, 1894, and "On Disorders of Assimilation, Digestion, &c.," London, 1904, p. 322.

[2] Reber, Wendell: *The Ophthalmoscope*, December, 1910.

feeling "as though her head would burst." She became morose and depressed, and began to fear she was losing her mental balance. She was distressingly thin, poorly nourished, and markedly neurasthenic. After correction of her hyperopic astigmia by glasses she gained eighteen pounds in six months, and lost all her symptoms.

To the foregoing I may be permitted to add one or two illustrative cases that have come under my notice. The first is one of agoraphobia definitely cured by glasses. A lady, aged 30, who had always been subject to "blind headaches," complained that for the last eighteen months she had become giddy on turning a corner or on passing into the light. During the last six months she had gradually developed a fear of open spaces. This symptom had become so marked that she was now unable to cross even an ordinary street, but if accompanied by a friend the feeling of fear was slight. In the right eye there was slight hyperopic astigmia, and in the left slight hyperopia. A prism of $\frac{1}{2}$ d., base out, was required to produce fusion of distant objects. In the first four months, during which glasses were worn constantly, the giddiness and agoraphobia were entirely lost. Glasses were then used for reading alone, and

there was a return of the symptoms, which again disappeared when they were worn constantly. In 1906 the lady suffered from pain behind the sternum ("inward neuralgia" was the diagnosis of her physician) for six months, during which period she had two slight attacks of agoraphobia, but no return of vertigo. With that exception, the patient, who has been under observation since October, 1905, has remained free from any anxiety when crossing open spaces, no matter how wide.

The second case is one of periodic attacks of nausea, vertigo, and retching, lasting with intermissions for several hours, and sometimes followed by intense headache persisting for twenty-four hours. The attacks, which always began at night when the patient was in bed, had been present for about six years, and were getting worse when I saw the case in 1907. The patient, a man, aged 38, was in a highly nervous state, incapable of work, and apprehensive of all kinds of impending misfortune. Glasses, prescribed in South Africa, had done no good. A London physician had suggested that the underlying condition might be one of obscure intracranial mischief. Briefly, there was hyperopic astigmia against the rule, with a considerable difference between the two eyes, and complete recovery of health

followed the constant use of glasses, which corrected the refractive error almost completely.

There would be little difficulty in multiplying such cases as the foregoing, but enough has been said to show the importance of examining the eyes in these curious psychoses. If this be done, we shall sometimes succeed in ridding patients from distressing symptoms but little under the influence of ordinary remedies.

The manifestations that, in my personal experience, uncompensated asthenopia may produce have now been described, but in that of others the list is by no means exhausted. Many other conditions have been assigned to the same cause, although not always, I think, upon adequate evidence. Among these conditions may be mentioned dysmenorrhœa (A. Doran, F. Hare), tachycardia (de Schweinitz), sleepiness (Zimmerman, Doyne), enuresis (Gould, A. H. Fardon), seasickness (Pronger), asthma (W. M. Richards), night terrors (de Schweinitz), constipation (L. Williams), tinnitus (Theobald), Ménière's disease (F. P. Lewis), dermatitis (T. H. Butler), sinusitis (W. L. Phillips), appendicitis (R. T. Morris), and pre-tuberculosis (F. P. Lewis); to say nothing of head-tilting and spinal curvature, and, more startling still, of the drug habit, crime, insanity, and suicide.

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