Ocular headaches / by Sydney Stephenson.

OCULAR HEADACHES.

BY

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OCULAR HEADACHES. (*a*)

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 some practical difficulty to trace a headache to its proper cause, although certain types of cephalalgia are generally recognised.

Excluding cases where headache is merely an early symptom of some acute infectious disorder, as typhoid fever, there are several tolerably 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, and the history of constipation and gastric disturbance generally suffice for the recognition of these cases. That a large proportion of headaches 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, more or less intimately bound up with anæmia. It is a familiar observation that such headaches are often relieved by the recumbent posture. (*c*) A similar kind of headache is common in cases of hysteria or of neurasthenia, possibly because the latter 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 unlucky enough to contract syphilis. Diagnosis in such cases is facilitated by the fact that the pain is generally most marked at night; that it frequently co-exists with tenderness of the scalp; and that the patient, as a rule,

(*a*) Paper read on January 9th, 1903, before the Wimbledon and District Medical Society.

shows other signs of a specific taint. The syphilitic headache, moreover, is somewhat peculiar in that, although it remits from time to time, yet it never altogether ceases. (*e*) Then, the toxic headaches, often due to the abuse of alcohol or tobacco, or to the retention within the system of waste products, as in uræmia, form a small but important class. (*f*) Intracranial growths, again, are generally associated with severe headaches of paroxysmal type. In such organic cases, however, other evidences of cerebral mischief will almost certainly be present, except, perhaps, in the earliest stages. The more important of these symptoms, as we all know, are vomiting, giddiness, paralysis, retardation of the pulse, and, above all, double optic papillitis, which (as first insisted on by Dr. 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 several hours or even the entire day, and terminating with vomiting. The victims generally belong to a good social rank, and the affection is markedly hereditary. Many headaches of this class, as I shall have occasion to show later, are intimately dependent on eye-strain (*asthenopia*), and can be relieved by the provision of suitable glasses.

If a given headache does not fall into one or other of the above 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 we are the more particularly to discuss, the so-called "ocular headaches"—that is, headaches which are induced or rendered worse by any attempt to use the eyes, especially upon fine objects and under artificial light.

Since the communications of Dr. Weir Mitchell, in 1874 and 1876, which brought prominently before the profession the various head symptoms caused by eye-strain, a good deal of attention has been directed by physicians to the eye as a cause for obscure headaches. About the same time as Dr. Mitchell's second paper (*a*) appeared, an extraordinary case, which has since became classical, was brought before the Clinical Society by Mr. R. Brudenell Carter. (*b*) An under-

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(*a*) S. Weir Mitchell.—*American Journal of the Medical Sciences.* 1876, page 363.

(*b*) *A Practical Treatise on Diseases of the Eye*, 1875, page 564.

graduate, whilst reading for honours, was suddenly attacked with symptoms, as palpitation of the heart headache, and sickness, 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 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. As Mr. Carter, in reporting the case, says, "His prospects in life were blighted, and his despondency was commensurate with his misfortunes." 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 satisfactory to add that when last heard of the patient was about to engage both in business and matrimony.

Ocular headaches are commoner than is generally thought. Indeed, it is such cases that help to fill the oculist's waiting-room, and such patients are among his most grateful clients.

As in most instances the connection between the eyes and head goes unrecognised by the patient, how are these headaches to be known for what they really are? To begin with, the ocular origin of any headache should be suspected when it is stated that the pain 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, while it is practically constant during the rest of the working week; or, again, that it is absent during the annual holiday. Under special circumstances, of course, the reverse may be the case. For example, in one of my patients—a banker six days a week and an ardent amateur artist on the seventh day—headaches are experienced only on the Sunday.

Much the commonest seat of pain is over the brow, and next to that in the temple. I have now and then come across an occipital headache definitely due to eye-strain and relieved by glasses. Vertical and general headaches are not unknown. The pain is usually bilateral, unless there be a marked difference in the refraction of the two eyes, when it, in my experience, is usually worse on the side of the better eye. Pain may present almost any degree of severity, but is apt to be described by patients as a "dull aching" in the affected parts.

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. A misleading statement now and then heard is that headache is present on awaking in the morning. But in such cases a little inquiry will generally bring out the fact that an unusual demand has been made upon the eyes the night before. Patients do not connect the two things, obvious though that may seem when put into black and white.

It must be borne in mind that ocular headaches are often, though not necessarily, associated with uncomfortable feelings in the eyes themselves. Such are aching, heaviness, fatigue, throbbing, watering, or redness. 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 lashes of which is a collection of fine, branny scales. Whenever this type of disease is seen, one's first thoughts should be of asthenopia. An outbreak of small styes, also, is often a guide, and so is frequent blinking, with or without slight facial contortions, liable to be mistaken for chorea.

In a given case it may be easy or the reverse to elicit these various complaints. Children, especially, are rather apt to complain of a headache only, and to conceal or to disregard the associated symptoms. It may be said in passing that a common complaint in children is that 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 true eye-strain. Thus, the eyes are stated to feel " sandy," and to be hot, burning, and uncomfortable, symptoms all of which become more pronounced towards night. The distinction between the two conditions, congestion and asthenopia, can be made by paying attention to the following points : (1) In catarrh the palpebral conjunctiva will show some signs of roughness or of increased vascularity ; (2) the eyelids, in catarrh, are apt to be closed with dried secretion on the patient awaking in the morning or after sleep at any time. Indeed, if on everting the eyelids to examine the conjunctiva, the slightest secretion exists in the con-

junctival sinuses, you may safely make the diagnosis of chronic catarrh at once, and forthwith institute a suitable treatment by astringent collyria. It may be worth while to remind you that evidence of traces of discharge may be obtained by dropping into the conjunctival sac a minim or so of a 2 % alkaline solution of that curious coal tar derivative fluorescëin, which will tinge any shreds of secretion a yellow colour, thereby allowing them to be easily recognised.

Now it is obvious that in headache due to eye-strain the severity of the symptoms will be the result of two main factors : (1) The kind and degree of any refractive or muscular error of the eyes that may exist ; and (2) the general state and constitution of the patient.

(1) *The kind and degree of the ametropia or muscular anomaly.*—The fact may be taken as axiomatic that any kind of ametropia, whether in the nature of hypermetropia, myopia, or astigmatism, may give rise to headache. But the liability varies much accordng to the particular kind of ametropia that may be present. My own experience in this matter coincides with that of most other observers, namely, that, of all errors of refraction, slight grades of hypermetropia, with or without astigmatism, are the commonest causes of ocular headaches. The higher grades of hypermetropia —say, anything over 4 D—give rise to so much distress and defective sight that, except in quite young persons, they nearly always fall under the attention of the ophthalmic surgeon sooner or later. It is, however, otherwise with the slighter degrees, where good vision for distant objects is obtained by unconsciously calling the function of accommodation into play. I need scarcely remind you that accommodation is in a state of abeyance in normal eyes when looking at objects twenty feet or more away from the patient. 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 hypermetrope must exercise to that end just as many dioptres of accommodation as he is hypermetropic. This accounts for the fact that on testing patients with the slighter degrees of hypermetropia with the Snellen types, which are adapted for a distance of twenty feet, normal acuity of vision is frequently obtained. Hence, you must never fall into the fatal error of thinking that the existence of $\frac{6}{6}$, that is normal vision, excludes either hypermetropia or hypermetropic astigmatism as a cause for obscure

headaches. The following examples may serve to emphasise this somewhat important practical point :—

NAME.	AGE	SIGHT.	REFRACTION.
William W. ..	12 years	6/5 = better than normal ..	+ 2·75 D spherical + 0·50 D cylindrical @ 60°
Jonathan K. ..	9 years	6/6 = normal..	+ 1·0 D spherical + 0·5 D cyl. @ 60°
Emily M... ..	12 years	6/5 ix. = better than normal	+ 3·5 D spherical + 0·5 D cyl. @ 150°
Ethel C. ..	10 years	6/5 = better than normal ..	+ 1·25 D. + 0·50 @ 90°
Catherine S. ..	8 years	6/5 = better than normal ..	+ 1·0 D spherical + 1·0 D cyl. @ 60°
Frank A. ..	10 years	6/5 = better than normal ..	+ 1·5 D spherical
Joseph S. ..	8 years	6/5 = better than normal ..	+ 1·25 D spherical
Charles P. ..	10 years	6/5 = better than normal ..	+ 2·0 D spherical
William H. ..	9 years	6/5 = better than normal ..	+ 2·5 D spherical + 0·5 D cyl. @ 90°
Wm. Jno. W...	10½ years	6/5 = better than normal ..	+ 0·50 D spherical + 1·0 D cyl. @ 90°
Alfred B. ..	7 years	6/5 = better than normal ..	+ 1·25 D spherical + 0·50 D cyl. @ 90°

There would be no difficulty in multiplying instances of this kind, but enough have been adduced to point the plain moral, namely, never to exclude the possibility of a headache being due to hypermetropia or astigmatism merely because the patient's distant

vision is normal. Neither does testing with the near-types render us much assistance in these cases, inasmuch as the smallest type will be fluently read by hypermetropes of low grade, at all events until they have passed the age of 40 years or thereabouts. In my experience, such cases must be tested with the ophthalmoscope under the influence of some agent that, when dropped into the eyes, is capable of temporarily paralysing the ciliary muscle, as atropine, or its sulphate or methylbromide salt (in children) or homatropine (in adults). My own practice under such circumstances is almost completely to correct the astigmatism, supposing the latter to exist. I nearly always order the glasses to be worn for all purposes.

As examples of headache caused by hypermetropia or hypermetropic astigmatism and relieved by glasses, I quote the following cases, selected from among a considerable number of which I have notes :—

Alice B——, æt. 35 years, had suffered from headaches since she was fourteen years of age. They were slight at first, but became much worse as she got older. They had latterly occurred about four times a week, and as they usually lasted all day, they practically incapacitated her from work. They began, as a rule, with "specks floating before the eyes," and now and then terminated with vomiting. They were described by the patient "as a throbbing and sharp pain all over the head." The eyes used to smart and feel strained when reading small print by gas light. Medical treatment of the most varied kind had been tried but without affording relief. On October 14th, 1901, when I examined the patient, I found no muscular deviation ; and after estimating the refraction under a cycloplegic, I ordered for constant wear R.E. $\frac{+\ 0{\cdot}25\ \text{Sph.}}{+\ 0{\cdot}75\ \text{Cyl.}\ 180^\circ}$.

L.E. $\frac{+0{\cdot}25\ \text{Sph.}}{+0{\cdot}50\ \text{Cyl.}\ 80^\circ}$ Miss B——was seen again fourteen months after her pince-nez had been prescribed. She reported that during the period in question she had not suffered from half a dozen headaches all told ; that the pain had been much less severe and had lasted 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.

Jane C——, æt. 22 years, reported that for six

months past she had experienced "a pulling at the back of the eyes," and that since she was a child 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 was stated to run with water. When examined on November 30th, 1899, she could read the smallest type, and her distant sight was greater than normal (V.=$\frac{6}{5}$). Under a cycloplegic, refraction was estimated, and the following spectacles ordered for constant wear, *viz.*, R.E. $\frac{+1{\cdot}75 \text{ Sph.}}{+0{\cdot}50 \text{ Cyl. } 60°}$ L.E. $\frac{+1{\cdot}50 \text{ Sph.}}{+0{\cdot}50 \text{ Cyl. } 60°}$ On November 28th, 1902—that is, nearly two years after the glasses were prescribed—I again saw this patient, who reported that, after the glasses had been worn for about a week, the headaches and other symptoms disappeared completely, and had not recurred.

Percy P——, æt. 21 years, a student of medicine, had suffered so severely from frontal headache and nausea that his parents had seriously thought of putting him to some less arduous occupation. Medical treatment had been as varied as it was unsatisfactory. Vision $\frac{6}{6}$, and No. 1 Jaeger's types. No muscular imbalance (*orthophoria*). Under a cycloplegic, the patient was found to be affected with slight hypermetropic astigmatism, with oblique and asymmetrical meridians. He was ordered for constant wear R.E. $\frac{+0{\cdot}75 \text{ Sph.}}{+0{\cdot}25 \text{ Cyl. } 80°}$ L.E. $\frac{+0{\cdot}75 \text{ Sph.}}{+0{\cdot}25 \text{ Cyl. } 110°}$ 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.

George A——, æt. 29 years. Headaches, described as violent, frontal, and occurring, on the average, twice a week, since his seventh year. They were induced by employing his eyes on fine objects. The patient wore glasses +1·75 D, which he had obtained from a "qualified optician." He was, upon examination, found to have 2 D of hypermetropia, with the small amount of 0·25 D of astigmatism, axis horizontal. After fully correcting this trifling astigmatism, but otherwise leaving the spherical glass as it was, the patient got rid completely of his headaches.

The foregoing cases have been specially selected because they illustrate the following practical points :—

(1) That it is the low degrees of hypermetropia and

especially of hypermetropic astigmatism that have the greatest tendency to give rise to 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 or 0·50 D.

(4) That the greatest discomfort, as in the third case quoted, 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 hypermetropic astigmatism, vertical or nearly vertical.

(5) That the ametropia must be estimated under the influence of a cycloplegic, as atropine or homatrodine. It may be remarked in passing that the relief to the pain obtained during the use of these agents is sometimes very marked. When this is the case, you may safely promise that the headaches will be cured by glasses, although the converse is not invariably true.

I have already insisted upon the point that the possession of normal vision—the so-called *relative visual acuity*—does not exclude the existence of hypermetropia or of hypermetropic astigmatism. The contrary, however, is the case with the other forms of ametropia, *i.e.*, myopia, myopic astigmatism, and mixed astigmatism. Every one of those defects reduces the normal acuteness of vision, but, unfortunately, from the physician's point of view, errors of refraction other than hypermetropia and hypermetropic astigmatism are relatively seldom the effectual causes of ocular cephalalgia. The following, therefore, is quoted as an exceptional case:—Andrew G——, æt. 22 years, was seen on January 21st, 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 normal with $\frac{+1\cdot0 \text{ Sph.}}{-3\cdot0 \text{ Cyl. } 180°}$. The constant use of these glasses freed the patient from all discomfort, and, when seen on August 1st, 1902, he assured me that he had never experienced a moment's pain since he had used them.

It might possibly be assumed from some of the above cases that from the first moment a patient begins to wear glasses his complaints cease forthwith. Such, however, is not always the case. If the error of reflection is almost fully corrected, many patients have to go through a period of more or less discomfort

before they reach a time when the glasses are really comfortable and relieve a headache from which they may happen to suffer. Many highly organised people have considerable difficulty in becoming used to glasses, and some, alas ! will not persevere long enough to obtain any relief. If the glasses are correct—not always an easy thing to make a patient believe—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 annoying effect of correcting astigmatism in adults by cylindrical glasses is the production of "binocular metamorphopsia." This manifests itself by an apparent distortion in the shape of familiar objects—as, 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 seen when going up and down stairs, and under other conditions that need not be more particularly specified. The change, which, as the name implies, is only visible when both eyes are open, has been accounted for in various ways. But the simplest explanation would be that there is a natural conflict and contradiction going on in the patient's mind between the impressions of a life-time and those resulting from the correction of an astigmatic and ametropic eye. Binocular metamorphopsia, as a rule, is complained of by observant people, and, above all, by artists. It can be overcome only by the constant and persevering use of the correcting glasses.

The following case will illustrate the foregoing remarks upon the subject of binocular metamorphopsia:

In September, 1893, a lady æt. 50 years, consulted me on account of failing sight. Each crystalline lens showed signs of incipient cataract. R.V. $\frac{6}{18}$—1·0 D $\frac{6}{9}$. 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. $\frac{+2\cdot0}{-2\cdot5\ 60°}$. With these glasses the patient, whilst in my room, could read the smallest print. A day or two after she had got her glasses I received the following very emphatic letter from the patient:—"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,"

In conclusion, a few words may be added about *megrim*, an affection that, in my experience, is often connected closely with ocular defects. This is no new observation, inasmuch as the connection was recognised by Piorry nearly seventy years ago, and has been commented upon by many writers, including Airy, Liveing, Ranney, Hewetson, Lauder Brunton, and Stevens, since that time. Indeed, in 1882, Dr. Savage (*a*), of Jackson, U.S.A., announced that he had discovered the "real cause" of sick-headache to be hypermetropia and astigmatism, and that its successful treatment consequently consisted in the use of proper glasses. In 1885, H. Bendelack Hewetson (*b*) 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. A year later (1886) Dr. Ambrose L. Ranney (*c*) 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."

Nowadays few people would probably care to go so far in their statements as Drs. Savage and Ranney, although at the same time it must be admitted that many cases of megrim are closely connected with eye-strain.

Let me quote the following case where the sequence of cause and effect appeared to be singularly free from fallacy: a very 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 for his professional examinations, the bouts had become severer and more frequent. He was affected, in fact, with classical "blind headache." The attacks began with a coloured and scintillating obscuration of central

(*a*) Savage.—*Medical and Surgical Reporter*, Philadelphia, July 29th, 1882.
(*b*) Hewetson.—*Medical Times and Gazette*, March 21st, 1885.
(*c*) Ranney.—*New York Medical Journal*, February 27th, 1886.

vision, and as this passed away, as it generally did in five to ten minutes, intense unilateral headache supervened. The attacks were always associated with nausea. They were brought on by (*a*) indigestion, and (*b*) straining the eyes, as with the microscope. There was a family predisposition to megrim; the patient's mother and sister suffered severely from the affection, and two of his children were also affected. The headache, as a rule, did not last for longer than an hour, but on one occasion it persisted for four days without intermission. General remedies did little, if any, good. At last, at the age of about 39 years, the slight hypermetropic astigmatism (0·5 D) was corrected with spectacles 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 fifteen years after the glasses were prescribed. It may be added that severe headaches can still be induced by attempting to use the eyes without glasses.

In the next case the relief afforded by weak glasses was very prompt and striking:—Grace C——, æt. 22 years, consulted me in November, 1902. She was a fine, robust-looking 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 generally lasted a whole day. It was followed by vomiting. She generally had two or three such headaches during the week. The eyes were stated to ache and to get 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 found; there was 1 D of hypermetropia in the right eye and 0·75 D in the left eye. Spectacles correcting this small amount of long-sight were ordered for constant wear. After six weeks' use of the glasses, Miss C—— reported that there had been no return of the headache, and that there was no aching, &c., of the eyes.

Megrim, contrary to what is sometimes thought, is far from rare in childhood. Nevertheless, it is perhaps uncommon to elicit a clear account from young patients of the classical symptoms, so that cases must often be overlooked. I have met with fairly typical attacks in children as young as six years. The following case. although occurring in an older child, may be quoted

because one or two unusual symptoms were present :— George D——, æt. 10 years, had suffered from three attacks of megrim, the first in the autumn of 1900. The attacks commence with an alteration in speech and a numbness of the right arm, and are followed by persistent vomiting. There is a strong family history of typical hemicrania, preceded by hemianopsia, in the mother and in several of her people. The patient, upon examination under atropine, was found to be affected with an extremely low grade of hypermetropic astigmatism, and the weakest cylinder of the trial case (+ 0·25 D), with its axis horizontal, was ordered for constant use. In the result, the megrim disappeared completely, and had not returned when the patient was seen a year afterwards.

I shall occupy no more of your time by quoting further instances of the relief or cure of megrim by the use of spectacles, although there would be no difficulty in doing so, but I shall simply say that, in my opinion, the eyes in every case of megrim should be examined as a matter of routine practice. I have good grounds for believing that in such cases relief can often be obtained by correcting the strain and confusion that arises in people of neuropathic disposition from even a small error of refraction or fixation. At all events, the experiment is worth trial in every case of so-called "sick-headache."

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 a correct innervation of the external muscles of the eyes. If this state of muscular equilibrium is disturbed, a squint, manifest or latent, will be the result. The manifest or obvious squint we may leave on one side, but the latent squint is of interest from our present point of view. Provided the sight of the two eyes is 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 in-

dicate the various kinds of 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 muscles," and is commonly associated with the higher degrees of myopia. Esophoria, on the other hand, is often combined with hypermetropia. 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 muscular defects 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 correction of associated ametropia, the use of prisms, exercise of the defective muscle or muscles, tonics, out-door exercise, and operations upon the muscles.

These muscular anomalies have been studied chiefly in America, where, rightly or wrongly, heterophoria 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 disorders of nutrition and derangements of nervous function, they are not seldom relieved by correction of ametropia, apart altogether from the question of muscular balance or imbalance. For example, Dr. Weir Mitchell quotes the case of a feeble, nervous, anæmic woman, æt. 30 years, with trifling hypermetropic astigmatism, who lost all pains, headache, and fatigue by wearing her glasses constantly. "The change in her appearance," wrote Dr. Mitchell, "was remarkable, and was, I think, solely due to relief of the strain with which she used her eyes." An interesting case of my own may be quoted in this connection. It is as under:—Theodora G——, æt. 12 years, the daughter of a medical man, came to me on September 22nd, 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 induced symptoms of an impending nervous breakdown. The child lost flesh, got white, and her health

became extremely poor. This led the parents to send the girl, when ten years of age, to Tasmania. On the voyage the patient put on flesh and seemed healthy in every way, but when sent to school soon after reaching Tasmania, all her former symptoms reappeared. A change to the mountains of Wesley Dale in the colony was tried, but without success. Finally, after staying for a year in Tasmania, she returned to England. Another ophthalmic surgeon, who had 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 need to interfere. Upon examination, I found the sight almost but not quite normal ($\frac{6}{6}$ partly). There was some exophoria, corrected by a prism of $1\frac{1}{2}$ D base in. Under atropine, slight compound hypermetropic astigmatism was found, and the following glasses ordered for all purposes :

R.E. $\frac{+0{\cdot}25 \text{ Sph.}}{+0{\cdot}50 \text{ Cyl. } 80°}$. L.E. $\frac{+0{\cdot}5 \text{ Sph.}}{+0{\cdot}5 \text{ Cyl. } 70°}$. The symptoms were relieved at once by the glasses, the child became brighter and better in all ways, and she was able to attend school just like any ordinary girl. In November, 1902, there was a slight recurrence of the headaches, coinciding with a change to a school where greater demands were made upon the eyes. Symptoms, however, soon subsided after a slight change had been made in the axis of the cylinders, and a brief trip undertaken to Switzerland.

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. The condition is common enough in England, but practically only in association with errors of refraction. Here the general opinion seems to be that its effects can be minimised 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 many trans-Atlantic surgeons.

Speaking for myself, I have met with a few, but very few, cases of vertical deviation, where headaches were promptly relieved by suitable prisms. It will suffice to quote a single case of this description :—Amelia P——, æt. 26 years, complained of vertical headaches, which had commenced when about fifteen 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, and were most marked during her menstrual periods. There was no error of refraction, but a right hyperphoria of 1 D existed. This was fully corrected by a weak prism before each eye, and the result was both prompt and satisfactory.

(2) *The general health and constitution of the patient.*— It is clear that an error of refraction or of muscular balance is more likely to cause headache if the patient is in poor health, as from influenza, or debilitated, as from lactation or a recent confinement. It is far from uncommon for discomfort to make its appearance for the first time under such circumstances, even although the ocular defect may have existed from childhood or even have been congenital. The explanation is simple. The general condition has involved the ciliary muscle, and so has rendered it unable to compensate hypermetropia or hypermetropic astigmatism. The converse is to some extent also true. The effects of eye-strain can often be relieved, for a time at all events, by the giving of tonics, the use of physostigmine to the eyes, and the leading of an out-door 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—the "neuropathic" disposition, as George T. Stevens (*a*) calls it.

Occupation, also, is not without influence. An ocular defect that would pass unperceived in an agricultural labourer 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 are recovering from some general illness; (2) in those of neuropathic disposition; (3) in those of sedentary habits, who use the eyes for long together; (4) in persons of good social standing and of more than ordinary education; and (5) in children and those who belong to the female sex.

(*a*) Stevens.—*Functional Nervous Diseases*, New York. 1887.