marks on similar cases observed by Mr. Story, Dr. Brailley, and Mr. G. Walker, that all the cases of death following enucleation in panophthalmitis had not been recorded; and this made him still more strongly of opinion that there was a real danger in enucleation in such cases. He was somewhat astonished that no one had ventured to doubt the connection, as Mr. Hutchinson and Dr. Mollière, of Lyons, had both put on record, in a very decided way, that they considered there was no danger. On the other hand, von Graefe and Professor Arlt both gave warning concerning the danger incurred.

ON THE BEST METHODS OF DIAGNOSING AND CORRECTING THE ERRORS OF REFRACTION.

Read in the Section of Ophthalmology at the Fifty-Second Annual Meeting of the British Medical Association.

By HENRY JÜLER, F.R.C.S.

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The subject of refraction is one which must necessarily be of the greatest importance to every member of this Section; and, although I have no new discovery to announce, yet I feel that, coming as we do from various parts of the world, this annual meeting should not be allowed to pass without some discussion of so important a branch of our practice. To attempt to describe in detail all the methods at our disposal for the detection of ametropia, would be impossible, as well as unnecessary, on this occasion. I will, therefore, only briefly refer to the chief methods that are in common use, with the hope that my remarks may elicit from other members many practical suggestions.

I will preface what I have to say concerning the testing of refraction by a few remarks as to the use or non-use of atropine or some equivalent mydriatic.

In myopia, where the vision can be improved up to the normal standard ($\frac{6}{6}$ and 0.5 Snellen) by means of spherical glasses, we are tolerably safe in prescribing the glass thus indicated.

In hypermetropia occurring in patients upwards of 20 years of age, the highest spherical glass thus indicated may also be recommended; but, in patients under 20, and especially in children, it is better always to paralyse the accommodation. In persons over 40, atropine is never necessary, owing to the natural weakness of the accommodation.

In astigmatism, whether simple, compound, or mixed, my experience is that no certain reliance can be placed upon the use of cylinders, unless the accommodation has been previously paralysed. A patient suffering from hypermetropic astigmatism, for instance, may be enabled to read $\frac{6}{6}$ with a concave cylinder, but such a glass could only be tolerated for a short time.

When the vision cannot be improved up to the normal standard by means of trial glasses, I consider that the accommodation should always be paralysed; otherwise, we have no means of ascertaining positive data as to the refractive condition of the eye, and the glasses prescribed may be only approximately correct, or they may be altogether wrong. We are, in fact, unable to decide positively whether the defective vision be due to spasm of the ciliary muscle so often present in hypermetropia, and astigmatism; whether to hysteria, hypochondriasis, to stupidity on the part of the patient, or even to malingering.

To illustrate my meaning as to the utility of using atropine, I will refer to a few typical cases which have recently occurred in my own practice. A boy, aged 12, presents himself, complaining of defective vision. With each eye he can see $\frac{6}{12}$ of Snellen, and concave glasses improve his vision to $\frac{6}{6}$, but no further. Convex glasses do not relieve him. By the ophthalmoscope and shadow-tests, he appears to be myopic. The fundi are normal, except that the optic discs are congested. Atropine drops, of strength one per cent., are prescribed, to be used three times daily for a week, when it is found that he has 8 D of hypermetropia in each eye. He has worn concave glasses for two years; these make his vision worse while using them, but he persevered because the prescribing surgeon was an oculist of high repute.

I believe this to be one of a large class of cases of hypermetropia in which diagnosis is rendered difficult by the existence of spasm of the ciliary muscle.

Another condition which is masked by spasm is illustrated by the following case. A lady, aged 30, presents herself, complaining of pain in the eyes and difficulty in reading, and fine work-vision cannot be improved beyond six-eighths. The ophthalmoscopic and shadow tests indicate mixed astigmatism. Atropine is used, and the case proves to be one of compound hypermetropic astigmatism. The spasm

of the ciliary muscle had rendered one chief meridian apparently myopic, and the other less hypermetropic than it should be. Imaginary difficulties in refraction are illustrated by the following case. A man, aged 37, V. = $\frac{6}{6}$, and he can read 0.5 Sn. at 20 to 40 centimetres, but states that his eyes begin to ache and his vision goes entirely after any prolonged attempt at reading or fine work. He has been to various oculists of eminence, who have prescribed weak convex glasses but without benefit. Atropine is used, and the refractive condition is found to be quite normal. In this case the mydriatic enabled us to exclude any possible latent hypermetropia, and to affirm that the patient was hypochondriacal, the latter diagnosis being confirmed by collateral symptoms. Similar cases to these occur in hysterical patients, in which the use of atropine enables us to state positively the refractive condition, and so to arrive at a conclusion which would be otherwise difficult.

Lastly, the following is illustrative of a large class of cases which come before us, in which the vision appears to be subnormal owing to ignorance, stupidity, or deceitfulness on the part of the patient, but in which we are called upon to say whether there is ametropia or not.

A healthy girl, aged 10, is brought by her aunt, who states that she cannot read either distant or near type. Her parents reside in India, and the child has been entrusted to strangers in France for her education and maintenance. Her vision is reported to be so defective that all education had been given up. Upon examination the fundus appears normal, and the eye slightly hypermetropic, but she cannot read either distant or near types. Atropine is used, and it is still found that there is only slight hypermetropia (0.5 S.), and the fact soon becomes evident that the child can see as well as other people, but that her education has been completely neglected. I consider that in this case I could not have been positive that there was only slight hypermetropia, and, therefore, that the child could see, unless I had atropised the eyes.

The cases just quoted will, I trust, make clear my reasons for asserting that, under the circumstances above mentioned, we are by no means certain of a correct diagnosis without previously paralysing the accommodation. To the use of atropine I know there are many objections. The blurring of the sight, by which the patient is incapacitated for fine work or reading, and the length of time necessary for recovery from the effect of the drug, are in themselves serious obstacles. These are shortened in duration by homatropine-hydrobromate, but I have not at present the same confidence in this drug that I have in the atropine-sulphate. Beyond the inconvenience of loss of accommodation, however, I consider the dangers from the use of atropine in persons under 40 years of age to be somewhat overrated; for, although I must have prescribed atropine for several thousands of cases during the last five years, I can only find notes of about a dozen such in which the drug has caused any other inconvenience. Of these atropine troubles, the chief are conjunctival inflammation, and dryness of the throat, which soon passed off with the discontinuance of the drug. From what I have said, it will be evident that, with the exception mentioned, I am a strong advocate for the use of mydriatics in ametropia, and that I have but slight confidence in any tests, whether subjective or objective, when applied to an eye in which the accommodation is active. In briefly referring to what I consider the best methods of ascertaining the degree of ametropia, I desire to be understood to refer to eyes which have been thoroughly atropised, or which are presbyopic.

First, with regard to the use of trial glasses. If the vision can be at once improved to $\frac{6}{6}$, by placing spherical, cylindrical, or spherocylindrical lenses in front of the eye, we are perfectly safe in accepting the strength of such lenses as the expression of the ametropia, and in prescribing such lenses, after making proper allowance for atropine; but if, on the other hand, the vision cannot be easily brought up to the normal standard by these means, then it is better at once to substitute some objective method of examination, rather than expend much valuable time and energy. In this method we are entirely dependent upon the patient, who may be intellectually deficient, illiterate, hysterical, or even malingering; there may be opacities of the media, or disease of the fundus; in either of which conditions only a negative result could be obtained by means of trial glasses alone, and I say that a great saving of time and trouble may be effected by at once resorting to some method in which we are independent of the perceptive faculties of the patient.

What has been said with regard to the use of trial glasses applies equally to optometers, such as the old optometer of Javal, or the more recent introduction of Mr. Tweedy, Mr. Couper, and other surgeons.

In the direct method of ophthalmoscopic examination, which has been so warmly advocated and thoroughly worked at by Mr. Couper, and which is now almost universally adopted by ophthalmic surgeons, we

have a most valuable objective test. By its means we can quickly, easily, and thoroughly examine the media and the various parts of the fundus oculi; we can also, without difficulty, determine the quality of any error of refraction. I believe, also, that, by prolonged practice, some observers become so expert that they are able to calculate the amount of the error of refraction in any given meridian. I regret to say, however, that in my experience, this power of estimating the exact quantity of error has been extremely difficult to acquire.

The essential rules for this method are (1) that the observer's eye shall be emmetropic, and his accommodation relaxed. (2.) That in myopia the weakest concave lens with which the fundus can be clearly seen is the measure of the myopia. (3.) That in hypermetropia the strongest convex lens with which the fundus can be clearly seen is the measure of the hypermetropia. (4.) That in astigmatism the refraction of either principal meridian may be ascertained by finding the weakest concave or the strongest convex glass, with which vessels whose course is at right angles to that meridian can be seen.

Now, with regard to the first of these requirements, I find it a very difficult matter to know where my own accommodation is completely relaxed. I am, therefore, uncertain as to the estimation of the quantity either of myopia or of hypermetropia. With astigmatism I am still less certain, for here we are obliged to examine, not the region of the yellow spot which corresponds to the visual axis, but the region of the optic disc, from which vessels are radiating in several directions. I say, that owing to the paucity of visible blood vessels in the immediate vicinity of the yellow spot, I should be unable accurately to estimate the amount of astigmatism even if I possessed the power of completely relaxing my own accommodation.

I admit, however, that an expert, and I believe there are many such, can often arrive at a very close estimate of the refraction, even of an astigmatic eye; but I know, not only from my own experience, but from that of many students and practitioners with whom I am constantly working, that this is an accomplishment somewhat similar to that of playing the violin; it requires not only aptitude, but prolonged and constant practice. To those who have thoroughly mastered the direct method it is a most valuable adjunct to the use of trial glasses.

With regard to the ophthalmometer of Javal and Schiötz, I can speak from experience. In conjunction with my colleague, Mr. Anderson Critchett, I have used this instrument ever since the International Medical Congress in 1881, in fact, we are in possession of the identical instrument which was brought to the Congress by the inventors. As a result of his observations, M. Javal states (*Annales d'Oculistique*, Julliet, Août, 1882), that astigmatism of the cornea constitutes the greater part of the total astigmatism in almost every case. In the same paper he further asserts that in prescribing glasses, which can in one minute be found by means of the ophthalmometer, we should often do better than by subjecting the patient to the annoyance of atropine. Encouraged by such assurance from M. Javal, we entertained delightful visions of being able to correct astigmatism without the usual tedium to ourselves and the annoyance of atropine to our patients. In a few instances the indications afforded by the instrument were in accordance with the total astigmatism, but in the majority of the cases that we have observed during the last three years the astigmatism of the cornea, as indicated by this instrument, has been either greater or less than the total astigmatism of the eye.

For these reasons we seldom trust to the ophthalmometer alone as a guide to the strength of the cylinders required. On the other hand, it is a valuable aid in testing the curvature of the cornea; it is particularly useful in indicating whether astigmatism be regular or irregular, and it shows at once the direction of the chief meridians.

In the shadow-test, which is variously known as keratascopy, retinoscopy, papilloscopy, etc., we possess a valuable objective method of estimating the actual refractive condition of the eye. By its application to the fully atropised eye, we can easily, quickly, and accurately estimate both the quality and the quantity of the error. These results can be obtained independently of the patient, and the observer is not called upon to relax his own accommodation in any special manner during the examination. Several variations as to detail are practised by ophthalmic surgeons in the application of this test.

In my own practice, I prefer to have the ophthalmoscope lamp, or the electric light, which is now supplied with Dr. Trouvé's battery, placed just above the patient's head in a darkened room. Then, using a concave mirror of twenty-five centimètres focal length, and standing about a mètre in front of the patient, direct him to look at my forehead until a glass is found which renders the shadow indistinct. I then gradually withdraw to the greatest possible distance at which the fundus can still be illuminated, usually from two to three mètres. If the shadow be still indistinct, I know that the ametropia is cor-

rected; if distinct, I know by the direction of its movement whether the eye is slightly over or slightly under corrected, by the glass now occupying the trial frame.

By directing the patient to look at the forehead and not sideways, we are enabled to examine the refractive condition of the yellow spot region (visual axis), and not that of the optic disc. This is of considerable importance, inasmuch as the refractive condition of the optic disc and the yellow spot regions are frequently found to differ.

The great advantage of the shadow-test is illustrated by the facility with which astigmatism can be estimated by its use. We all know that, in former times, a case of mixed astigmatism was a matter of great weariness and perplexity, both to the surgeon and the patient. First he could, and then he could not, see the letters clearly; at one moment he preferred a concave cylinder; but, half an hour later, a convex one seem to be quite as good, until at last the case was not unfrequently consigned to the unsatisfactory category bearing the vague heading asthenopia. Thanks to the shadow-test and the use of atropine, the number of cases of so-called asthenopia are rapidly diminishing, and we can quickly and satisfactorily correct even the worst forms of regular astigmatism.

With regard to the exact manner in which astigmatism can be worked out by this test, I should be glad to hear the experience of other members present.

The plan I adopt is, first to correct one chief meridian by means of a spherical lens, and then to place cylinders in front of this until the remaining shadow disappears. The facility with which an exact estimate can thus be formed of an astigmatic eye, leads me to look upon this method as the best objective test we possess.

Having thus, in the most approved fashion, ascertained the total amount of refraction in a given eye, it remains for us to discuss to what extent the error should be corrected. Is it desirable in all cases to render the eye emmetropic; or must we sometimes stop short of a full correction? This is a point upon which there is much diversity of opinion, and upon which I should be glad to hear the views of ophthalmic surgeons here to-day. For my own part, I always endeavour, first to find the glasses which best correct the eye while the patient is fully under the influence of atropine; then, having waited until the eyes have thoroughly recovered from the mydriatic, I try the same glasses again, and deduct only so much of the spherical lens as is necessary to give good near and distant vision.

I know that it is said that, in young myopes, the constant use of glasses which fully correct the ametropia is liable to produce an increase of the affection; but I find it difficult to reconcile this theory with facts which have come under my own observation. I believe that, except in very high degrees, the majority of myopes, whether young or adult, are the better for a full correction; and that those who at first find this irksome for near work may, with a little training, and perhaps with a slight preliminary reduction in the strength of the glass, be brought to rejoice in the possession of good near and distant vision by the constant use of one pair of glasses only.

In hypermetropia, again, I believe that too much spherical lens is frequently deducted from the total correction; and that the higher the glass with which near and distant vision can be obtained, the greater will be the boon to the patient, especially after a continued use of the glasses.

In astigmatism, the strength of the cylinder which corrects the difference between the chief meridians must not be altered, after atropine.

In all cases, the proper allowance must, of course, be made for presbyopia.

REMARKS ON THE THERAPEUTIC ACTION OF THE ACONITUM FEROX, OR INDIAN ACONITE.

Read in the Section of Pharmacology and Therapeutics at the Fifty-Second Annual Meeting of the British Medical Association.

By D. H. CULLIMORE, M.D., M.R.C.P. Lond. and Dubl., F.R.C.S.

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BESIDES the aconitum napellus, with the efficacy of which as a vascular sedative and antipyretic, owing to the initiation of Fleming and the persistent teachings of Ringer, all are familiar, we have, in addition, the following species of this drug;

1. The Aconitum paniculatum, which is devoid of pungency;
2. The Aconitum Fisheri, or Japanese aconite, which deserves investigation, as it is said to be largely used in England under the name of the aconitum napellus;