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A CONTRIBUTION TO OPHTHALMOSCOPY,

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BY

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A CONTRIBUTION TO OPHTHALMOSCOPY.

Instead of the present slow and tedious method of determining the refraction of the eye by the Ophthalmoscope, I have to propose that a modified Stokes lens be employed in place of the cumbersome and troublesome number of spherical glasses generally used.

The instrument which I believe will answer the purpose best, is that made by Crètés, of Paris, a short description of the modifications of which, from the usually arranged Stokes, I have given in a paper on the use of the Stokes lens as a determiner of the refraction. I would, however, modify the instrument of Crètés by using still stronger cylindrical lenses, so as to include a greater number of lenses in its action ;* making the diameter of the lenses half the size, or thereabouts, so that the observer has no difficulty in approaching close up to the patient's eye, a great advantage when he will observe the peripheral portion of the retina in the erect image; and arranging at the other end of the handle that the scale giving the equivalent lens for the different rotations is well extended, in order to have the action of each definitely marked. By moving the whole lens through the quarter of the circle, or having the axes of the lenses marked, and the rim of the box in which they are placed graduated, the two lenses together

*For the method of calculating the power given to each lens according to the rotation—*vide* Donders, &c.

standing at any desired angle, might be rotated to any part of the quadrant.

Either using the lenses as they are, or placing a simple black screen, perforated in the middle, behind the lenses, in a half-ring placed there, sufficient illumination is obtained to examine the fundus in the upright image; but should any other mirror be preferred, plane, concave, or convex, one made to suit the ring may be used.

Looking into an emmetropic eye, the observer being emmetropic, the lens standing at zero, a distinct image will be obtained, but should there be ametropia in any meridian, the meridian of the image, whose rays pass through the ametropic meridian, will be indistinct, and it will be required to turn the whole lens (or the two lenses) perpendicular to the meridian not plainly seen, and move the indicator till this meridian becomes sharply defined.

I shall take an example to show the procedure better:—

Should I, on looking into the eye, find no distinct image, I move the indicator on the lens downwards, and note where I begin to perceive an image. Should the vessels in the vertical meridian of the image become distinct, I diagnose hypermetropia, knowing that in moving downwards, the lens standing in the vertical position acts as a + c, † (1) and a —c, ∸ (2) and therefore acting on the rays which pass through the horizontal meridian, coming from the vertical meridian of the

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(1) Convex cylindrical lens with the axis vertical.

(2) Concave cylindrical lens with the axis horizontal.

retina, as a convex cylindrical glass, and on those passing through the vertical meridian, coming from the horizontal meridian of the retina, as a concave glass; and to determine the degree in this meridian, I move on the indictaor till I see the vessels and fundus of this meridian distinct. I now move the lens round on its axis, the fourth of the circle, watching the different meridians as they become distinct, and should they all do so, the case is one of simple hypermetropia, of the amount marked by the indicator. Should, however, any meridian not be distinctly seen with the indicator standing at the same point which gave the vertical meridian, I move the indicator till it becomes distinct, noting the number at which it becomes so, and the motion of the indicator in relation to the zero point, and so passing round the quadrant I get all the meridians exactly determined, the differences giving the astigmatisms, and the greatest and least numbers, the maximum and minimum refraction.

Should, on moving the lens downwards, the horizontal meridian have become distinct, I diagnose myopia and proceed in the same manner as in hypermetropia.

Moving the lens upward gives exactly the opposite results, the horizontal meridian becoming distinct in hypermetropia, and the vertical meridian in myopia, the lens acting as a — c † and a + c -+ on being moved upwards.

A half-ring placed in front of, or behind the lens, may be used as a supporter of any lens required to neutralise the hypermetropia or myopia of the observer, so that the numbers marked on the handle give him, without further calculation, the amount of the observed ametropia.

In cases of astigmatism there will appear, at a certain rotation of the lenses, an equally distinct or rather indistinct image of the fundus in all meridians, which occurs when the case is reduced to a case of hypermetropia or myopia by the action of the concave cylindrical lens on the rays passing through the one meridian, and the action of the convex cylindrical lens on the rays passing though the opposite meridian, and having already ascertained the maximum and minimum refraction, the practitioner can now add to the Stokes lens the convex or concave spherical necessary to correct the hypermetropia or myopia, which will give him a view of all meridians distinctly at once. I have given such a case in the paper before referred to, and to it, and the diagramatic representations of the different conditions of ametropia annexed thereto, I refer any one interested in the matter.

By remembering the actions of the lens there given, I believe that any one accustomed to use the ophthalmoscope will, by having all the different degrees of lenses corresponding to the strength of the Stokes used, capable of being brought rapidly and regularly before him, without the necessity of having once taken his eye from the image, find in the method a means of more accurately determining the refraction, and in a shorter time than by the present mode of use of spherical lenses.

Instead of the Stokes as generally made with two cylindrical lenses, I have sometimes used two lenses, each consisting of a + 10c in one half, and a —10c in the other. By rotating two such lenses, mounted in the same way as Stokes' lens, you can obtain all the different degrees of convexity or concavity from 0 to 1-5th, *e.g.* when the axis of the concave half corresponds to the axis of the convex half you have a Stokes at the zero point, and it acts as a Stokes when these two halves are rotated on each other; but when either the concave rotates on the other concave, or the convex on the other convex, you obtain an increase of the action as a concave or convex lens, and pass on from 1-10th to 1-5th, according as the lenses rotate on each other. This used with or without a slit, gives a cylindrical with a spherical action to a certain extent, the cylindrical action being less the narrower the slit. The different convex, cylindrical, or concave cylindrical lenses, may be used in the same way, and thus obtain by a few cylindrical lenses an amount of spherical action extending from the single to the combined power of the lenses employed. If the instrument is used by patients, it is better to limit them to a certain quadrant of the circle, before which the glasses can be revolved in any combination desired, the limit being made by a diaphragm.

Having determined the refraction, the condition of the retina may be viewed by the same instrument (Stokes lens), but this will require a motion of the lens on its axis and of the indicator. And as some may possibly prefer, knowing now the glass required to give a distinct view of the fundus, to use a spherical lens in the usual manner, and so obtain a better view of the relations of the different portions of the Fundus to each other, I propose to construct an Ophthalmoscope, a combination of the modifications of those from Helmholtz, Loring, and Schulek, with the addition of a graduated handle and motion of the disks, after the same method as Stokes lens, as constructed by Crètés. It would consist of two disks having each eight apertures, one without any lens, the other seven having in the one disk concave 2, 4, 6, 8, 12, 18, 24, and the other convex 4, 6, 8, 12, 18, 24, 48, or any other combination that may be thought more suitable—(vide Schulek's Ophthalmoscope in Zehenders Archives for 1871.) Each disk would be rotated by a button on the handle, and the action of each lens marked on the corresponding side thereof, thus obviating the necessity of moving the eye once from the examination—should it be desired to determine the refraction by such,—and the usual unpleasant change of disks or glasses. Should none of the lenses mentioned give the proper correction, the other disk has only to be revolved on the first to obtain most of the intermediate numbers, by acting on the concave glasses with the convex, or on the convex with the concave. A half-ring placed in front of the disks can receive any mirror preferred. The mirror, disks, and lenses ought to be made as thin as possible, and the aperture of the mirror—if a metal mirror is used—and the two apertures in the disks should have knife edges. The disks ought to be small in diameter, so as to allow of a near approach to the eye.

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