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The Technics of the Trial Case ;
or, Subjective Optometry.

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THE TECHNICS OF THE TRIAL CASE; OR, SUBJECTIVE OPTOMETRY.

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AFTER we have subjected the eye to one or more objective tests, we finally make use of the trial lenses and test cards before prescribing glasses. It is the exact *method and order* of procedure in placing the lenses in the trial frames in refracting cases that I wish chiefly to call attention to in this article.

Simple cases of hyperopia and myopia are, as a rule, easily fitted to glasses; but a certain definite way should be followed even in these cases. It is the astigmatic cases that give most trouble, and among these, as is well known, the compound hyperopic and mixed astigmatisms are the most difficult to fit.

Astigmatism is the thing of most importance in correcting errors of refraction, and I invariably correct the astigmatism first, unless there is a large amount of spherical error present—a myopia of eight dioptries or more, or a hyperopia of six dioptries or more—with only a small amount of astigmatism. In such cases part of the spherical error is



first to be corrected, in order, if possible, to bring up the vision sufficiently so that the eye will appreciate any further change in acuity of vision when a weak cylindrical glass is placed in front of it.

I always begin my test by putting on *plus* glasses; plus cylindrical glasses if the lines on the clock dial (Green's) indicate astigmatism, plus spherical glasses if astigmatism is absent, and for the following reasons: First, since we have not used any objective methods, we do not know if the patient is hyperopic or myopic. If the patient happens to be hyperopic, plus glasses are accepted, as a rule, if begun with; however, if minus glasses are first tried, the patient many times accepts them, especially if the error is of low amount, though the patient is really hyperopic. This fact is so well known that it is hardly necessary to more than simply allude to it. The eye instinctively makes an effort to overcome minus glasses when placed in front of it; the ciliary muscle is thrown into a spasm of accommodation, producing an artificial myopia, which the minus glass partly or wholly corrects, and in this way apparently improves vision. The mere fact that a patient accepts minus glasses is no indication whatever that he has myopia. Furthermore, minus glasses should never be tried until plus glasses have been tried, unless we know beforehand that the patient is really myopic, for, as pointed out above and as will be demonstrated farther on in this paper, they tend to incite a spasm of accommodation, the very thing we wish to avoid.

The thing of next importance to plus glasses in beginning a test is that we shall begin with the *weakest* lenses in the trial case and go up gradually. I do this also to avoid spasm of accommodation, for by adding a quarter of a dioptre at a time the eye accustoms itself to it and the ciliary muscle relaxes gradually if it is only given a chance.

Should all, or almost all, of the correction be put on at once, however, the change for the eye is so sudden and marked that it will not adjust itself to it; whereas, had the glasses been gradually increased in power, the ciliary muscle would have relaxed. This is my experience, and I believe it accords with that of the great majority of observers.*

By following this plan spasm of accommodation, if present, can in the great majority of cases be overcome, and if not present, the liability of causing it be avoided. Certainly a great gain by a very simple method.

Another method of avoiding spasm of accommodation, and one well known among oculists, is to correct both eyes at the same time.

A few concrete cases will serve better to demonstrate the method and order of a subjective examination with the trial case, test cards, and clock dial than anything else.

First Proposition.—A patient placed twenty feet from the test cards and clock dial sees $\frac{5}{8}$ (Snellen) in each eye, and the horizontal lines of the clock dial plainest.

If there is no spasm of accommodation present, this indicates that we have a hyperopic astigmatism, simple or compound, or a mixed astigmatism with the hyperopic portion greater than the myopic portion, all with the rule; or a myopic astigmatism, simple or compound, or a mixed astigmatism with the myopic portion predominating, all against the rule. A glance at diagrams 1, 2, 3, 4, 5, and 6

* Some oculists, however, resort to putting on very much too strong plus glasses to get rid of spasm of accommodation. By beginning the test with very high plus glasses they blur the vision completely, and in that way take away the desire to accommodate for or fix on any object. Then, by gradually diminishing the power of the glass, the correct glass is finally accepted. For myself, I much prefer to begin with the weakest and work up.

will show this, the lines that are seen plainest always corresponding to the meridian of greatest error of refraction, as should be. The vertical meridian of the cornea is emmetropic, or more nearly so than the horizontal meridian in all the above-mentioned cases, and, as the horizontal lines on the clock dial are seen by the rays of light passing

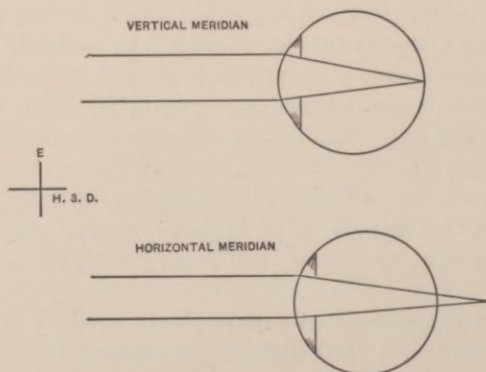


FIG. 1.—Simple hyperopic astigmatism with the rule.

through the vertical meridian of the cornea, it follows as a consequence that those lines on the dial are seen plainest. But we are to decide which one of the above six conditions is present.

First Step.—Put a $+0.25$ D. cyl. ax. 90° (which is at right angles to the lines seen plainest on the dial, according to our first proposition) in front of the eye. If this improves his vision for the test types, or even does not make it worse, and at the same time brings out the vertical lines on the dial plainer, or makes them no dimmer, I add the next stronger plus cylindrical glass—a $+0.50$ D. cyl., ax. 90° . If this improves both the vision and the lines I keep adding plus cylindrical glasses, a quarter of a dioptre

stronger each time, until they begin to make him see worse. The strongest plus cylindrical glass that gives the best vision and at the same time brings out the lines on the clock dial with equal clearness is the proper glass. According to Fig. 1 this would be a case of simple hyperopic astigmatism, and the patient should obtain the best vision he is capable of having with a + 3 D. cyl., ax. 90° .

Second Step.—Say, however, when we reached a + 3 D. cylindrical glass that the lines on the dial were of an equal clearness, but that the vision of the patient was not perfect. The next, or second step, is to put on the weakest plus spherical glass in front of the cylinder to see if the patient has any manifest hyperopia in addition to his astig-

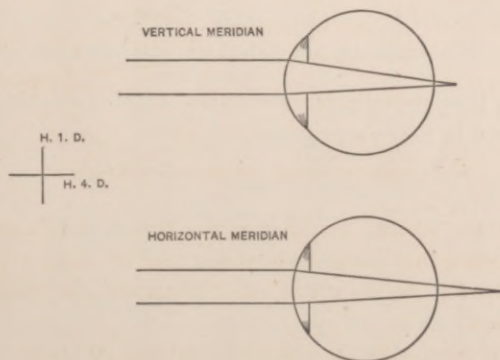


FIG. 2.—Compound hyperopic astigmatism with the rule.

matism. If he accepts the weakest glass, and that with improvement, continue to add plus spherical glasses, a quarter of a diopre stronger each time, till they begin to make the vision worse. Say a + 1 D. spherical glass gave him the best vision. This would be a case of compound hyperopic astigmatism, as represented in Fig. 2. Of

course, the patient might have latent hyperopia in addition to the manifest, but, as a rule, unless marked (2 D. or

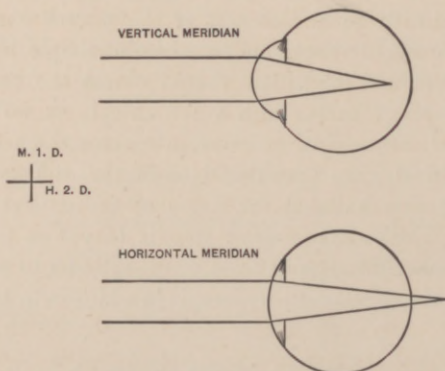


FIG. 3.—Mixed astigmatism with the rule, hyperopic portion predominating.

more), it rarely calls for correction, a point especially emphasized in Roosa's writings.

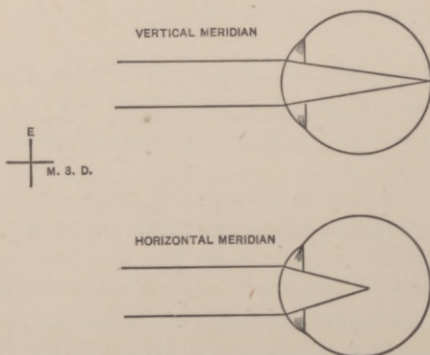


FIG. 4.—Simple myopic astigmatism against the rule.

Third Step.—If a plus cylindrical glass improves but does not give perfect vision, and a plus spherical glass in

addition does not continue to improve the vision as in the second step, a mixed astigmatism is to be suspected. The next or third step is to begin with the weakest minus cylindrical glass at right angles to the plus cylindrical glass. If this improves the vision and at the same time makes the lines on the clock dial plainer and more nearly equal, continue to add stronger minus cylindrical glasses till the weakest minus cylindrical glass that gives the best vision and renders all the lines on the clock dial equally clear is reached. Say in the above example a $+ 2$ D. cyl., ax. 90° \ominus $- 1$ D. cyl., ax. 180° is accepted. This would indicate a mixed astigmatism with the rule, as represented in Fig. 3.

It will be noticed in this case that all of the lines on the clock dial are first equalized in clearness of outline by

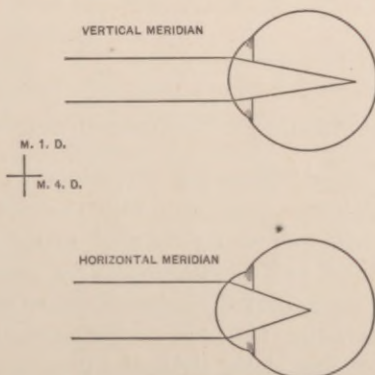


FIG. 5.—Compound myopic astigmatism against the rule.

a plus one-dioptre cylindrical glass, though all of them remain dim. This is simply from the fact that a plus one-dioptre cylindrical glass allows the rays of light going through the horizontal meridian of the cornea to focus one dioptre behind the retina, the same distance the rays going

through the vertical meridian focus in front of it, consequently a perfect diffusion circle is formed on the retina. When a greater than a plus one-dioptre cylindrical glass is added, the vertical lines on the clock are brought out plainer than the others, and remain plainer till the test is completed, when they all appear equally clear and the vision is brought up to the best possible to be obtained.

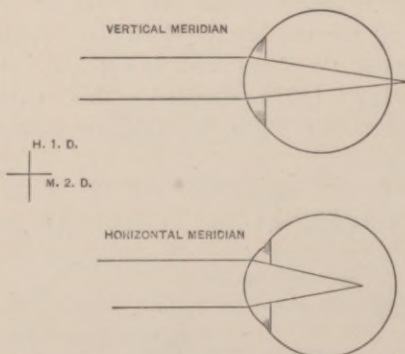


FIG. 6.—Mixed astigmatism against the rule, the myopic portion predominating

Fourth Step.—If the patient will accept no plus glass at all, the fourth step is to begin with the weakest minus cylindrical glass, axis at right angles to the lines seen plainest, or at 90° , as it might prove to be a case of myopic astigmatism against the rule. If the -0.25 D. cyl., ax. 90° improves the vision and at the same time brings out the vertical lines of the clock dial plainer, continue to add minus cylindrical glasses, increasing their strength gradually until the weakest minus cylindrical glass is reached that gives the best vision and equalizes the lines on the clock dial. If the vision is made perfect by this cylindrical glass—say it is -3 D. cyl., ax. 90° —it is useless to add minus spherical glasses in addition, because the

mere fact that he sees perfectly shows that he has no myopia in addition to his astigmatism, for no myope can see perfectly or have vision equal unity. The above case, therefore, according to the glasses accepted, would be simple myopic astigmatism against the rule, as shown in Fig. 4.

Fifth Step.—Should the -3 D. cyl., ax. 90° bring out all the lines on the dial with equal clearness, but not give perfect vision, then the weakest minus spherical glass is to be placed in front of the cylindrical glass. If this improves vision, continue to add minus spherical glasses till the best vision of which the patient is capable is obtained, being careful to stop with the weakest spherical glass that gives the best vision. Say a minus one-dioptre spherical glass is accepted in addition to the minus cylindrical glass. If no spasm of accommodation exists, this would indicate compound myopic astigmatism against the rule, as demonstrated in Fig. 5.

Sixth Step.—If a minus cylindrical glass (say a minus two-dioptre) improves but does not give perfect vision, and a minus spherical glass, in addition, does not continue to improve the vision, as in the fifth step, a mixed astigmatism may be expected. Especially may it be looked for if the vertical lines on the dial are now left plainer than the horizontal ones by the simple minus cylindrical glass alone. The next step is to place a weak plus cylindrical glass at right angles to the minus cylindrical glass. If this improves vision, continue to add plus cylindrical glasses till the strongest plus cylindrical glass that gives the best vision and renders all the lines on the dial equally clear is reached. Say this is a $+1$ D. cyl., ax. 180° . This, combined with the -2 D. cyl., ax. 90° , would indicate mixed astigmatism against the rule, as shown in Fig. 6.

Second Proposition.—A patient placed twenty feet from the clock dial sees the vertical lines on the dial plainest.

This indicates a hyperopic astigmatism, simple or compound, or a mixed astigmatism with the hyperopic portion greater than the myopic portion, against the rule in each case; or a myopic astigmatism, simple or compound, or a mixed astigmatism with the myopic portion greater than the hyperopic portion, with the rule in each case.

The *six steps* to be followed under this second proposition are similar in principle to those followed under the first proposition. Always begin with the weakest plus cylindrical glass, placing its axis at right angles to the lines seen plainest on the clock dial,* and follow successively the six steps outlined under the first proposition.

In cases of simple hyperopia or myopia, where neither plus nor minus cylindrical glasses are accepted, plus and minus spherical glasses are to be tried in turn, always beginning with the weakest and gradually increasing till the strongest plus or the weakest minus spherical glass is reached which gives the best vision.

The entire subject may be recapitulated in four brief sentences, viz. :

1. Correct the astigmatism first, if present.

2. Always begin the test with a *plus* glass and a *weak plus* glass, and *gradually* increase the strength, in order to avoid or overcome spasm of accommodation, bearing in mind to place the axes of cylindrical glasses at right angles to the lines seen plainest on the clock dial.

minus cylindrical glasses alone; fifth, minus spherical

3. Place the lenses in the trial frames in the following order, viz. : First, plus cylindrical glasses alone; second,

* The exception to this is where there is a mixed astigmatism, with or against the rule, with the myopic portion predominating. In such cases, if we begin with a plus cylinder, we must place the axis of the cylinder parallel with the lines seen plainest on the clock dial. See Fig. 6 as an example.

spherical glasses in addition ; third, minus cylindrical glasses at right angles to the plus cylindrical glass, if vision is not made perfect by a plus cylindrical glass alone and plus spherical glasses are not accepted in addition ; fourth, glasses in addition ; sixth, plus cylindrical glasses at right angles to the minus cylindrical glass, if vision is not made perfect by a minus cylindrical glass alone and minus spherical glasses are not accepted in addition.

4. If no astigmatism is present, plus spherical glasses are to be tried first ; if not accepted, then minus spherical glasses.

Mydriatics are rarely ever called for, if the above method of procedure is followed out.

I am aware of the fact that this method, as outlined by me, is contrary to that recommended and practised by some eminent men of to-day. Instead of considering every case as hyperopic to begin with, they prefer, if the case is not already one of myopic astigmatism,* to convert it into such by means of spherical glasses.

Secondly, they recommend that the meridian of least refraction be corrected first and with spherical glasses. They propose to do this by having the patient look at the lines on the clock dial first and before letting him see the test types ; to put on minus spherical glasses till some one of the lines on the clock dial is distinctly seen, or to put on plus spherical glasses as long as any one of the lines on the dial remains clearly seen.

Thirdly, when astigmatism is combined with any spherical error, they recommend that the astigmatism be fitted first. †

* Of course, cases of simple myopia and hyperopia are not considered here.

† See paper on this subject by George J. Bull, *Ophthalmic Review* London, September, 1895.

With the third recommendation I am in hearty accord, as the tenor of this paper shows. The other two recommendations I think unnecessary, illogical, and ill-advised, and for the following reasons :

First, in cases of compound myopic astigmatism, if the meridian of least refraction is fitted first by spherical glasses, according to their second recommendation, they must necessarily fit the spherical part of the error first, instead of the astigmatism first, as directed by their third recommendation.

Second, in order to convert a simple or a compound hyperopic astigmatism or a mixed astigmatism into a myopic astigmatism it is assumed that the meridian of least refraction will accept a spherical glass up to the full amount of error, which assumption is not so by any means, especially as regards plus spherical glasses. For example, take a hyperopia of two dioptries with an astigmatism of one dioptry with the rule. In such a case a plus three-dioptry spherical glass is requisite to correct the meridian of least refraction, it at the same time over-correcting the other or vertical meridian by one dioptry. This over-correction then, according to their plan, is to be corrected by a minus one-dioptry cylindrical glass, axis at right angles to the lines seen plainest on the clock dial. It has been my experience, however, that these patients will not accept the full correction for the meridian of least refraction; but a certain amount of hyperopia remains latent, and this without any evil effect in many cases. If we first correct the astigmatism in such cases without converting it into myopic astigmatism, the remaining hyperopia can easily be tested by the simple addition of spherical glasses. If they are accepted, very well; if not, leave it alone, unless it is excessive in amount.

Incidentally, in closing this paper I may add that where

the astigmatism has been ascertained beforehand by any of the objective methods, the subjective method outlined in this paper can be followed with even more satisfaction than when depended upon alone; and of the three objective methods—ophthalmometry, retinoscopy, and ophthalmoscopy—I much prefer that of ophthalmometry, for the following reasons: First, it is much the quickest; second, it is the most accurate; third, it does not dazzle the eyes as do the other two, by having light thrown into them, which is a very important factor. After light is thrown into the eye for any length of time it dazzles it in exactly the same way, but to a less extent, than the sunlight does when reflected from the snow, and impairs any subjective test immediately following.

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FRANK P. FOSTER, M.D.

THE PHYSICIAN who would keep abreast with the advances in medical science must read a *live* weekly medical journal, in which scientific facts are presented in a clear manner; one for which the articles are written by men of learning, and by those who are good and accurate observers; a journal that is stripped of every feature irrelevant to medical science, and gives evidence of being carefully and conscientiously edited; one that bears upon every page the stamp of desire to elevate the standard of the profession of medicine. Such a journal fulfills its mission—that of educator—to the highest degree, for not only does it inform its readers of all that is new in theory and practice, but, by means of its correct editing, instructs them in the very important yet much-neglected art of expressing their thoughts and ideas in a clear and correct manner. Too much stress can not be laid upon this feature, so utterly ignored by the “average” medical periodical.

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