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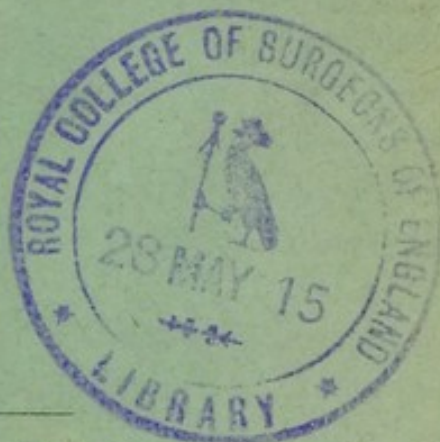
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FROM THE FIRST SETTLEMENT
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INSUFFICIENCIES OF THE OBLIQUE MUSCLES AND HOW TO CORRECT THEM.*

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In the Archives of Ophthalmology, Vol. XX, No. 1, 1891, I announced my discovery of "Insufficiency of the Oblique Muscles." I closed that paper by saying of the nervous symptoms brought about by this state "I can see no hope of prevention or cure." On the 17th day of May, 1892, while a patient was before me whom I had known to be a sufferer from this condition for two years, and to whom I had often said "There is not now, nor can I see how there ever can be, any relief for this trouble," a thought of the proper means of correction dawned upon me. I at once applied the newly thought-of principle in this case and with the most gratifying results. Of this case I shall have more to say before closing this paper.

Before setting forth the treatment I will refer to the condition itself, and the proper means of detecting it. In doing this, since I cannot do better, I quote from my paper published in the Archives: "Every ophthalmic surgeon, however skilled in correcting errors of refraction and in operating for the different known forms of heterophoria, has had cases of eye-strain for which he could do but little. In investigating a few such cases during the last six months I have found the cause to be a want of equilibrium on the part of the *oblique muscles*. The detection of this condition is easy. I place a double prism (my modification of the Maddox prism) before one eye, the other for the moment being covered, and ask the patient to look at a horizontal line on a card held eighteen inches away. The effect of the double prism (each 6° , bases in), so placed that the axis

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is vertical, is to make the line appear to be two, each parallel with the other. The other eye is now uncovered, and a third line is seen between the other two, with which it should be perfectly parallel.

“While a change of the position of the axis of the double prism from the vertical towards the horizontal will alter the distance between the lines, their direction will be unchanged, hence no loss of parallelism. This fact admits of a little carelessness in the placing of the prism in the trial frames, though the axis should be vertical so as to give the maximum distance between the two extreme lines.

“If there is a want of harmony on the part of the oblique muscles this test will show it at once in a want of parallelism of the middle with the two other lines, the right end of the middle line pointing towards the bottom and the left end towards the top line, or *vice versa*, depending on the nature the of individual case.

Fig. 1.

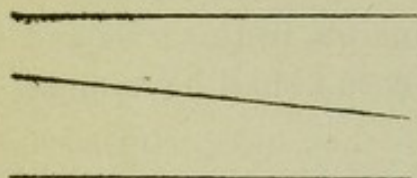


Fig. 2.

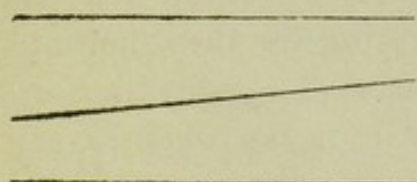


Fig. 3.

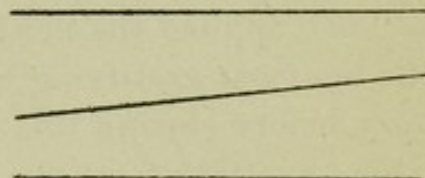


Fig. 4

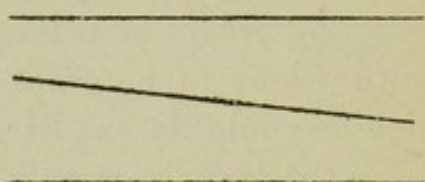
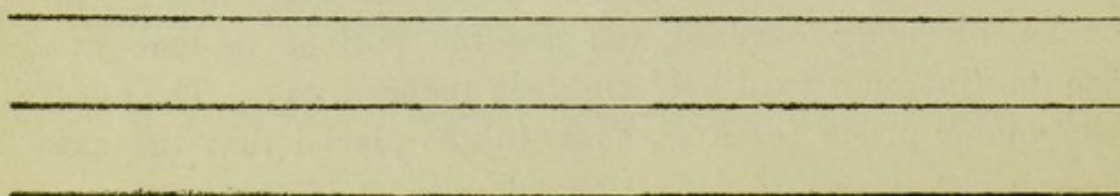


Fig. 5.



“In my investigations I have always considered the eye before which no prism is held as the one under test. With the double prism before the right eye the patient is asked about the position and the direction of the middle line. It may be nearer the bottom, thus showing left hyperphoria; or again, it may extend farther to the right than the other two and not so far to the left, thus showing exophoria, or vice versa, showing esophoria.

“If the right ends of the middle and bottom lines converge while the left ends diverge, the superior oblique of the left eye is at once shown to be in a state of underaction. Fig. 1 represents such a test of the left eye. Fig. 2 shows a test of the left eye when the inferior oblique is the too weak muscle. Fig. 3 represents a test of the right eye, the loss of the parallelism between the lines being due to underaction of its superior oblique, and Fig. 4 the same condition of the inferior oblique of the right eye. Fig. 5 represents a test of both eyes when there is perfect equilibrium of the oblique muscles.

“As is well known, the function of the oblique muscles is to keep the naturally vertical meridians of the two corneæ parallel even when not vertical, [except in cases of uncorrected oblique astigmatism, as shown in Vol. 1, No. 1 of the *Ophthalmic Record*]. This must be, or a troublesome form of double vision will result. If there is perfect equilibrium of the obliques, this parallelism of the meridians named is maintained without trouble; but if the superior oblique of either eye be too strong for its inferior, or vice versa, the parallelism of the vertical meridians is preserved, and double vision prevented, only by excessive work on the part of the weaker muscle. This condition of the oblique muscles brings on, at longer or shorter intervals, a train of nervous symptoms for which, at present, I can see no hope of prevention or cure.”

As can be readily seen the condition described then was *symmetrical insufficiency of the obliques*. Up to that time I had not seen, nor had I heard of, a case of *non-symmetrical insufficiency of the obliques*.

Dr. Moulton, however, reported such a case in a letter* to the

*See *Ophthalmic Record*, Vol. 1, No. 4, 1891.

editor of the *Ophthalmic Record*. I had reasoned that such a condition would not give trouble, since the strong muscles would be allowed to act, thus revolving the two eyes in the same direction, but causing no disturbance of vision. I still believe this reasoning correct except in cases of corrected astigmatism. Such a case Dr. Moulton reported, asking for an explanation of the fact that it became necessary for him to rotate his 1.00 D. cylinders from 90° to 100° , in order that the patient might have comfort, when several examinations under atropia had shown that the axis of each cylinder should be at 90° . My explanation, published in connection with his letter, was that there was insufficiency of the superior oblique of her right eye and the inferior oblique of her left eye; that these weak muscles, at the times of the several examinations, exerted their full amount of power and thus kept the best meridians at 90° ; that these muscles at other times, because of fatigue, could not exert the necessary amount of power, and thus allowed their stronger opposing muscles (the inferior oblique of right and superior oblique of left) to change these meridians from 90° to 100° . It was at such a time as this that the Doctor learned that the axes of his cylinders should be placed at 100° . Comfort came to, and remained with, his patient as a result of this little procedure. It was good practice and should be followed in all cases of astigmatism where there is *non-symmetrical insufficiency of the obliques*.

In *symmetrical insufficiency of the obliques* the case is very different both in principle and practice. It is for this latter condition that I am now able to point out the remedy.

To illustrate clearly the principle and practice I will take up for study the case of J. B M., age thirty-five, whose case I was studying the moment the thought of the cure came to me. Two years ago he came to consult me about a headache that for a long time had troubled him, and which was growing more severe. He had been advised that it was probably due to eye-strain and if so, it could be cured by properly adjusted-lenses. A preliminary examination showed only a slight error of refraction. This he consented to have corrected, hoping that he would get

relief, other means having failed. Under homatropine the following correction was given:

O. D. V. = $\frac{20}{xx}$ with + .25 \odot + .25 cyl. ax. 155°.

O. S. V. = $\frac{20}{xx}$ with + .25 \odot + .50 cyl. ax. 90°.

It was determined at the same time that he had $\frac{1}{2}^{\circ}$ left hyperphoria. It was also determined that he had insufficiency of both right and left superior obliques. He was told that all but the latter could be corrected; that he would get some, but not complete, relief by wearing his sphero-cylindrical lenses, the left ground on a prism of $\frac{1}{2}^{\circ}$ base down; that, at times, the insufficiency of the obliques would give him trouble for there was nothing that could be done for this condition. I did tell him, that, if, when engaged in near work, he felt a headache coming on, he might cover one eye with a flap thus doing away with the strain necessary for harmonious action of the muscles of the two eyes. This he tried occasionally, but found it very inconvenient to work with one eye only. His attacks of suffering were greatly lessened in both frequency and severity for some months, as a result of the elimination of some of the factors formerly constituting the cause of his suffering.

He wore his spectacles continually, but after a while his headaches began to return. They grew more frequent and more severe untill he became an almost daily sufferer. Not infrequently on going home from his office his wife would have to put him to bed like a child. He would occasionally take medicines prescribed by his family physician to relieve the severity of the attack.

At intervals, during the whole time, he would consult me. When complaining I would tell him that I believed that the then-active cause was the insufficiency of his superior obliques, and that I was powerless to do more than I had already advised. A few months ago I made a second examination of his eyes under the influence of homatropine, but only to find that the result of my former examination was correct. I did not have to urge him to wear his glasses, because he had learned that he was more comfortable with than without them.

On the 13th of May, 1882, he came to me and said that I must do something more for him; that he must have relief.

Insufficiencies of the Oblique Muscles.

Reminding him that I had twice investigated his eyes and each time had found the same conditions and had corrected all that was correctable, I told him I was willing to try again, but that I was now as unable to correct the insufficiency of his obliques as I ever was. In the course of this conversation I told him if he had but one eye he would not be a sufferer. Deciding that it would be four days before he could return for another examination he went away. On the 17th at the hour appointed he came; and without hope of finding an additional means of relief, I under-took the investigation again. The results of former examinations as to lenses were confirmed.

My study of the recti muscles resulted as formerly in finding a left hyperphoria of $\frac{1}{2}^{\circ}$. With the remark "we will now look into that incorrectable condition," I began to investigate the obliques. Placing the 6° double prism before his right eye, the left eye (the one under test) showed the middle line dipping unmistakably to the right, as in Fig. 1, thus showing insufficiency of the left superior oblique. Transferring the double prism to the left eye, the right eye showed the middle line dipping to the left, as in Fig. 3, thus showing insufficiency of the right superior oblique. Having stated again that nothing more could be done for him, in a moment the thought occurred to me that, if a cylinder was placed before the eye in such a way as to make the line incline still more in the same direction, on removing the double prism the weak obliques would have to act more than usual in binocular vision. I reasoned that this over-action being in the nature of gymnastic exercise, if conducted properly must develop the weak muscles, and thus be a source of relief to the patient. Leaving the double prism in front of the right eye I placed a + 2.00 cylinder before his left and revolving it so as to bring its axis to 135° the middle line was seen to dip very much more to the right. I then turned the axis back to 90° when the dipping was the same as when no cylinder was on. Turning the axis of this cylinder to 45° the middle line was made parallel with the other two (this little procedure of placing the axis of a cylinder obliquely first in one direction then in the other, and watching the effect on the middle line will establish or disprove the correctness of the diagnosis). The diagnosis

made and positively confirmed, I at once commenced the gymnastic exercise by placing a + 2.00 cylinder before each eye, the axis of the right at 70° and the axis of the left at 110° . The patient was asked to fix his vision on a candle twenty feet distant (the double prism had been removed). In three minutes the axis of right cylinder was turned to 60° and that of the left to 120° ; three minutes later the axis of right was placed at 50° and that of left at 130° ; and again in three minutes the axes were changed, the right to 45° and the left to 135° . With each turning there was additional demand made on the superior obliques, the maximum being reached when the axes were respectively at 45° and 135° . With each turn the patient could feel additional strain. The cylinders were allowed to remain in this position of maximum effect three minutes when they were removed and the double prism test was applied. There was the slightest, if any, dipping of the middle line. Both patient and practitioner felt encouraged. He has returned daily for the *exercise* which has been conducted every time in the manner above described.

On the day after the first *exercise* he resumed his office work which requires almost continuous near use of his eyes, and has been absolutely comfortable up to this time—the end of the eleventh day—and not one dose of medicine has been taken. For the last three days before beginning the *exercise* the test when applied to either eye showed but little, if any, want of parallelism of the lines. His improvement has been rapid and remarkable.

I have now under the exercise treatment a little girl, age fifteen years, whose trouble is insufficiency of the inferior obliques. The dipping of the middle line is to the left in the left eye, and to the right in the right eye, just the contrary of what was found in the other case.

The *exercise* in her case is carried on by revolving spasmodically the axis of the right cylinder from 90° to 135° and that of left from 90° to 45° , the reverse of the plan in the first case. She does not bear the exercise so well as the first patient, but her improvement in five days is noticable.

My records for the past two years show a number of cases of *symmetrical insufficiency of the obliques*, to all of whom I stated : "for this condition I can do nothing."

The condition is real, the treatment is rational, and relief must follow. The condition is easy of detection and the insufficient muscle can be quickly located. The double prism before the right eye, the middle line is seen by the left (the one under test); if it dips towards the opposite (right) side the superior oblique is insufficient (see Fig. 1), if towards the same side the inferior oblique is insufficient (see Fig. 2). The same is true when the right eye is under test as is shown in Figs. 3 and 4. In the treatment either concave or convex cylinders can be used; if the concave are used and the insufficiency is in the superior obliques the axes must be placed in the lower nasal quadrant, if in the inferior obliques then the axes must be placed in the lower temporal quadrant. If for the exercise the convex cylinders are chosen the axes must be placed in the lower temporal quadrant for insufficiency of the superior obliques and in the lower nasal quadrant for insufficiency of the inferior obliques. In either case the effect is increased as the axis is made to move from the vertical to the point of maximum effect which is 45° from the vertical.

The exercise may be commenced with a .50 to a 1.00 D. cylinder, and increased each day a .50 D. up to 3.00 D. The cases will be very rare that will require a stronger exercise ~~prism~~ *cy* than the last named. The graduated exercise should be continued daily. Each eye being affected, the exercise cylinders should be placed before both.