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THE NON-SURGICAL TREATMENT OF HETERO- PHORIA.*

GEORGE M. GOULD, A.M., M.D.
PHILADELPHIA.

Had I chosen my own title I should have omitted the word "non-surgical," because in my practice I have concluded that there is no surgical treatment, properly speaking; and that any operative treatment whatever of heterophoria is not only useless but bad. For, not only does it not cure, but, in my experience, it makes real cure far more difficult, sometimes even impossible. I say, "in my experience," which is in private practice, with intelligent and co-operating patients. In hospital practice there may be rare cases in which operation is required. For six years I have seen no case of heterophoria needing operation, and none unsatisfactory when treated with common sense instead of with scissors. Of course, if the scissorer's design is to create mental effects in the patient and financial ones in both patient and doctor, that does not lie in the province of medicine, and we may look, smile, and go about our own business. But, if the object of scissoring is to lengthen or shorten a tendon, it seems to me that one will soon arrive at two or three indisputable facts: 1. In the vast majority of cases heterophoria is an innervational affair. 2. It depends upon errors of refraction. 3. Proper spectacles are the principal and effective means of cure, with the aid of prism gymnastics in exophoria. It seems unnecessary to add that it should go without saying that all other intercurrent complicating, or systemic conditions that are causative of ocular weakness and imbalance must have been diagnosed and treated. Sometimes, certainly, such are alone responsible for the mischief. The oculist who is indifferent to or ignorant of such general causes, is not, as he should be, a physician before being a specialist. He is only one grade better than the pseudo-oculist who treats all eye-strain as due to systemic causes.

As to *hyperphoria*, owing to the narrowed range of muscular action of the vertical muscles some cases appear to be peripheral rather than central in origin, and with such the question would seem to be pertinent, why not tenotomize? My answer to that would be Yankee-like: Do you know a surgeon that you would trust to operate upon your own hyperphoria? I am sure that if I had ever so high a degree I would endure the evils that I had rather than fly to others I know not of. Perhaps, however, the choice would be precisely because of evils witnessed and known. For instance:

CASE 4077.—This was a professor who for a few degrees of hyperphoria had the right superior rectus "snipped" by a famous oculist, and the left eyeball was so frightened that it tried to hide under the upper lid, producing a bad effect upon the onlooker and for the patient diplopia, loss of occupation, and great wretchedness, financial, social and psychic. There seemed nothing for it but an advancement. But, before submitting he came to me. Under strict promises of secrecy not to divulge his colleague's name, who occupied a chair in the same college, I undertook the doubtful task of curing a traumatic hyperphoria of seven degrees without other surgical instruments than a couple of pieces of glass! In snipping a snip the snipper had utterly ignored a tormenting astigmatism. A partial prismatic correction added to the cylinders subsequently reduced, finally made my friend shower me with benedictions whenever we met. He does not now refer his patients to his fellow-professor!

The highest degree of hyperphoria or hypertropia I have successfully treated by refractive methods was that of:

CASE 3681.—A lawyer had 15 degrees and had been advised by a dozen or two of the best specialists to permit tenotomy. He had shrunk from following the advice although diplopia and subjective symptoms had come near wrecking his health and his business career. When he came to me, I of course found that his ametropia had been ignored or mistreated. I combined with his spherocylinders 12 degrees of prismatic correction and in a short time this was further reduced to 10 degrees. Health and happiness were completely reinstated in six months.

I do not think I have a dozen patients wearing prisms permanently for the correction of hyperphoria. Under proper ametropic correction these, like most heterophorias, disappear. It is only as regards this and the frequency of required operation that I differ from my friend, Dr. Reber, in the conclusions which he draws in the most excellent study of 150 cases of heterophoria read before this Section last year at Atlantic City. The factors of proper treatment are:

1. The absolutely accurate estimation of the refractive errors by cycloplegia and the subjective method and the prescription of spectacles and their adjustment according to the hundred modifying conditions of the individual case.

2. When the hyperphoria is 3 degrees or over, a temporary but partial neutralization by prisms may be necessary to tide over the period required by Nature to re-instate a normal balance of innervation.

3. Supplementary ocular gymnastics, mere excursions of the eyeballs upward and downward, etc., aid in bringing about balance.

4. Instruction in ocular hygiene is frequently helpful. The book or writing habitually placed too far below the horizontal plane may be productive of much eye-strain. High arm-chairs and other similar devices would vastly lessen the sufferings of many people.

* Read at the Fifty-second Annual Meeting of the American Medical Association, in the Section on Ophthalmology, and approved for publication by the Executive Committee of the Section: Drs. J. A. Lippincott, Casey A. Wood and H. V. Würdemann.

Esophoria of a symptom-producing kind, like hyperphoria, is extremely rare, is innervational, and is dependent upon ametropia. Permanently worn prisms of course only increase the disease, and tailoring the tendons is utter delusion. For example:

CASE 2996.—A literary worker had both internal recti cut, reducing his esophoria of about 18 degrees to orthophoria for a month or two, but finally resulting in a reinstatement of all the old imbalance. Again the intense sleepiness came back and again the scissors were appealed to, but with precisely the same results as before. After a year of proper ametropic correction the esophoria is 6 degrees and as much happiness exists as is ever possible after the peripheral mechanism has been uselessly mangled.

Equally instructive is the case of a studious minister, who, with extreme use of the eyes at near range, has not a symptom and yet he has 20 degrees of esophoria. He requires only accurate correction of his ametropia. Hundreds of case-records show either a reduction of esophoria to a normal balance by means of ametropic correction alone, or, if not always so, there is complete absence of symptoms. Data and methods of treatment are:

1. Normal balance or physiologic orthophoria is for city-folk and near-workers, 2 degrees or 3 degrees of esophoria estimated by the Maddox-rod test, at 20 feet with suspended accommodation.
2. When there is less than 2 degrees the tendency and result is exophoric.
3. Orthophoria is almost surely a disease, likely to be worse than the higher degrees of esophoria.
4. Esophoria from 3 degrees to 6 degrees produces no symptoms with proper ametropic correction.
5. Esophoria above 6 degrees and up to the strabismic limit may or may not produce symptoms of eye-strain.
6. All esophoria is curable or at least modifiable by convergence-repression, i. e., by high corrections in hyperopia and by low corrections in myopia, but above all by proper corrections of astigmatism and anisometropia.

Exophoria, or insufficient adduction-power, is the most frequent, 50 to 1 surely, of all heterophorias, and, fortunately, the most amenable to treatment. I greatly dislike rules and laws in the practice of medicine, because there may be almost as many exceptions to almost any rule as there are instances in proof. But in a general way, I find by experience:

1. Real exophoria or insufficiency of adduction-power in a near-worker may exist and be productive of mischief when the 20-foot test shows 1 degree or 2 degrees of esophoria.
2. Orthophoria is usually exophoria, i. e., it is a disease. There is in city-dwellers, usually, an insufficient innervational power of the interni, with 20-foot balance.
3. With positive 20-foot exophoria, eye-strain and brain-tire exist in proportion to the degree of the defect.
4. Cure by prism-gymnastics is quick according to the youth of the patient, and the lowness of the degree, slow in proportion to the greater age, lessened vitality, and highness of the degree of the exophoria.
5. A not infrequent result of the prism-gymnastic treatment of exophoria is the continuance of more or less of the original exophoria as measured by the 20-foot test, but with an increase of the adduction-power five or ten, or even twenty times, there will finally come a cessation of the symptoms.

6. Having attained this high adduction-power, with relief of the symptoms, a continuance of the prism-gymnastics must be kept up occasionally with the highest power prisms, to prevent, as in any function, deterioration by disuse.

The only methods of treating exophoria of which I have any experience are:

1. Accurate estimation of the ametropia, and its correction according to the exophoria to be overcome. Low hyperopic corrections and high myopic corrections are, of course, the rule, according to the degree of the defect, but also according to the hundred of co-operating conditions, the power of accommodation, the presbyopia, the anisometropia, the age and vitality of the patient, the severity of the symptoms, the occupation, the responsiveness of reaction to prism-gymnastics, the adduction-power, etc. No finer problem or more complex one exists in medicine than this of prescribing glasses in exophoria. The prescribing optician, the "ophthalmotrician," or even the six-weeks' post-graduate specialist may not be trusted with it any more wisely than a baboon with an astronomic observatory.

2. With all fitting deference to wise advisers, I am unable to see or to imagine what least good could be accomplished by the use of so-called gymnastics with weak or low degree prisms. Attempting to jump over a thirty-foot wide stream by a two or three-foot jumper can result in little more than a deserved cold-water bath. Two or three degree helps can not meet the indications of a twenty or fifty degree weakness.

3. The gist of the matter is to increase adduction-power until it is equal to the demands. This increase of power is easily, quickly, and infallibly procurable by daily exercises with prisms, bases out, and as rapidly as the power rises, the prisms increased in degree until either the exophoria has been replaced by esophoria or the symptoms have all disappeared. Hold the power gained by occasional exercises, according to the amount of near work demanded of the eyes and also according to individual tendency to reversionary weakness. In low degrees of exophoria a frequently effective method of treatment is by what I have colloquially designated, "thumb exercises." These consist in the patient holding the thumb at arm's length on a level with the eyes and gazing fixidly at the nail while the thumb is brought accurately between the eyes as closely as is possible without any failure of the eyes to converge. The instant divergence or diplopia is detected, withdraw the hand again to arm's length, and thus continue these rhythmic exercises for several minutes, several times a day. If the increase of adduction-power and the relief of symptoms is proved insufficient, then the method of prism-gymnastics must be instituted.

4. The technic of prism-gymnastics in exophoria is: *a.* Begin with the highest degree prisms with which the images of a point of light are kept single. *b.* The prisms should be square and not round and must be accurately mounted and accurately adjusted. Holding the prisms in the hands as has been advised does harm, not good. *c.* The exercises should be ordered about four times a day, for about five minutes at a time. *d.* They should be with the object gazed at fixedly and earnestly ("with knitted brow," "savagely"). The distance of the object should be varied by an attendant, or by walking about, from 10 inches to 20 feet or more. The prisms should be raised away from the eyes and lowered about twenty-five times while gazing at differently distanced objects, during each seance. *e.* The patient

should be instructed to distinguish and guard against outward rotation of one eye with diplopia, etc.—a quickly harmful procedure. *f.* So fast as adduction-power grows, the strength of the prisms should be increased. This will usually be by 3 degrees or 5 degrees at a time, and every two or three days, until the limit is reached, esophoria induced, or the symptoms disappear. *f* have sometimes carried the adduction-power as high as 80 or 100 degrees before the desired result appeared. *g.* With a wished-for increase of adduction-power there is likely to be a change of ocular pressures and corneal curvatures so that a retesting of the ametropia becomes necessary.

It seems useless to take up your time with a brave array of case-histories. Hundreds, perhaps thousands, could be collated. The lessons derivable from them is all that seems necessary. The chief ones I gather from mine are as follows:

The infinite patience and clinging to hope on the part of the physiologic and neurologic ocular mechanism is a constant source of wonder and delight, and teaches the daily law to help Nature along the lines of her desires by common-sense and physiologic methods. Her motto is surely *nil desperandum*, and it should be ours. We shall rarely fail when we try to aid Nature's method of spontaneous therapeutics. We should beware of our impertinent surgical short-cuts. Surgery is the despair of medicine, and we should never adopt surgical methods while there is a glimmer of hope by natural means and in the directions indicated by the subtle and inherent strivings for normality. To show but one case illustrative of what Nature and the doctor may do when they work together let me cite:

CASE 2870.—A physician's little girl of 7 came to me with 28 degrees of exophoria, i. e., her exophoria was really exotropia, the divergent strabismus being habitual except under the stimulus of the violent will to converge, when binocular vision was possible for only a few seconds. With a 3-degree prism, base out, this temporary power was impossible. I would not consent to operation. It took about four years of treatment, but to-day the child has slight esophoria, constant binocular vision, perfect acuity, and absence of all eye strain.

Even in cases of positive strabismus natural or non-surgical methods may prove effective if the patient is taken in hand sufficiently early in life, before amblyopia has become too pronounced, and before morbid habits have been too long continued.

THE OPERATIVE TREATMENT OF HETEROPHORIA.*

G. C. SAVAGE, M.D.

PROFESSOR OF OPHTHALMOLOGY, VANDERBILT UNIVERSITY.
NASHVILLE, TENN.

On what cases of heterophoria should we operate? On what muscle should the operation be done? What kind of operation should be done? These are all questions that should be answered by the operator before undertaking this class of work. Certainly, an innervational heterophoria should never be operated upon. A pseudo-esophoria is always curable by convex glasses. A pseudo-exophoria is likewise curable by concave glasses. There are cases that present themselves now and then in whom there is a want of convergence innervation, i. e., there seems to be a fault in the third conjugate innervation.

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This condition, as a rule, should be treated by exercise, though occasionally an operation must be done.

No operation should be done in cases of heterophoria, intrinsic in character, that can be relieved by gymnastic exercise, even though this treatment should have to be resorted to for a long while. Nor should those cases be operated upon whose muscle error is small, and for whom comfort can be obtained by the wearing of weak prisms in positions of rest.

The heterophorias not curable by correction of errors of refraction, by prisms in positions of rest, or by rhythmic exercise, should be subjected to operative procedure. Such cases are not infrequent, and the relief from operations skilfully done is by no means uncertain. There is no department of surgery that requires more care in the making of the diagnosis. The condition of every extrinsic ocular muscle must be determined before any one muscle is to be operated upon. There are but two objects in view in muscle operations, the one is altering the tension of the muscle, the other is changing its plane of action.

In order that I may be the better understood when I speak of the operation involving the changing of the muscle plane, it would be well to define it. The rotation plane of any muscle cuts the center of origin of the muscle, the center of rotation of the eye, and the center of the muscle insertion. The axis of rotation is always at right angles to this plane. The plane of an internus or an externus muscle may coincide with the horizontal plane of the eye, when, of course, the vertical axis of the eye becomes the axis of rotation. In such a condition the contraction of an internus or externus will effect only one motion, viz., the rotation of the eye directly in, by the internus, or the rotation of the eye directly out, by the externus. When the center of attachment of the internus is above the horizontal plane, no longer can the muscle plane coincide with the horizontal plane, and a contraction of the internus results in a complicated movement of the eyeball. An internus thus attached not only turns the eye in, but also turns it up and torts it in. The center of the insertion of an externus above the horizontal plane results always in a complicated movement, turning the eye out, turning it up and torting it out. When the centers of attachment of these muscles are below the horizontal plane, the secondary results of their action are the reverse of those mentioned, i. e., a too low internus turns the eye down as well as in, and torts it out; a too low externus turns the eye down as well as out, and also torts it in.

The tension of a muscle is to be altered either by a central partial tenotomy, as when operating on the too strong muscle; by shortening the muscle in the line of its original plane or by advancing it straight forward, as when operating on the too weak muscle. In making either one of these operations the existence of a cyclophoria must be first excluded. When there is cyclophoria complicating any one of the other heterophorias, the operation on the rectus muscle should alter the tension of the muscle and at the same time change the plane of its action. In such a case a partial tenotomy should not be central only, but should include those peripheral fibers, a division of which would be corrective of the cyclophoria. A shortening should be done in such a way as either to raise or depress the plane of action of the muscle as might be indicated by the complicating cyclophoria. In making advancements, the new attachment should be