

tions. In a case of neurasthenia whose complexion was of the same pasty, dirty color, excellent results were obtained by using glycocholate of soda alone without any other treatment.

#### CONCLUSION.

The indiscriminate use of glycocholate of soda is to be avoided; it is not suited to all cases, and although there are no contra-indications for its use yet good results are only to be expected in those cases of gallstone formation of so-called torpid liver as found in certain diseases, such as alcoholism, drug habits, melancholia and its congeners, constipation, chronic malaria, etc.; it also materially aids the digestion of fats and may prove a useful adjunct in wasting diseases of all kinds.

### THE PRESENT STATE OF OUR KNOWLEDGE CONCERNING SO-CALLED PARTIAL OR GRADUATED TENOTOMIES AND THE HETEROPHORIAS.\*

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For nearly thirty years partial or graduated tenotomy for the correction of heterophoria has been on trial. It at once received the attention of numerous advocates and opponents. The reports presented by Stevens and later by Ranney and others were confirmed or disapproved according to the experience of individual observers. There seem to be still a few who doubt the possibility of obtaining a result from a partial tenotomy, and others who doubt the efficacy of any operative interference in correcting heterophoria. The value of the operation can only be judged by a careful study of a large number of cases extending over a long period of time, recorded by many observers.

#### LEGITIMATE PARTIAL TENOTOMY.

It is not my purpose to discuss in this paper the pros and cons of the questions involved in the study of the relation of certain forms of imbalance of the ocular muscles and eye strain to so-called functional nervous diseases. I shall only take up the question of the status of partial tenotomy as a legitimate procedure when employed for the correction of heterophoria.

By partial tenotomy we mean cutting through the central mass of the tendon and extending the incision into the aponeurotic fibers as far as is necessary in order to secure the desired amount of displacement. A graduated tenotomy may be partial or guarded. A guarded tenotomy is one in which the tendon is severed, but retained or limited in effect by a stitch.

There are three important requisites in making a study of heterophoria and its correction: First, a thorough knowledge of the mechanism of the motor apparatus of the eye; second, a full appreciation of the technical difficulties to be overcome by the operative procedure; third, a hand skilled in operative experience. The same is true of the treatment by prism exercises and ocular gymnastics.

If we take for our guide in anatomy the descriptions of the tendons given by Fuchs, Gray and others, there would be no such thing as obtaining an effect from a so-called partial tenotomy. They do not describe or give sufficient importance to the fan-like expansion of the muscle, which plays so important a part in the operation of partial tenotomy. The best early description of the tendon and the aponeurotic expansion, I found in the

article by Liebrecht, published in 1871. In his paper he recognizes and insists upon the importance of the lateral fibers which go off from the tendon and are attached to the ocular wall both above and below, also the direct fibers of the tendon which unite with the adjacent aponeurotic expansion of the muscle on either side, thus forming what is known as the annular ligament. Some of the later works on the subject give the tendon as described by Liebrecht, dwelling on the importance of the annular ligament as modifying the action of the muscles out of the vertical and horizontal planes.

Shall we operate for the relief of the symptoms caused by heterophoria? Two classes take extreme views. Happily these classes are composed of but a small number of those doing special work. The motto of one class of extremists is in all cases to operate, of the other never to operate.

#### THE AUTHOR'S CREED.

My creed may be stated in the following general way. Render your patient the service which in your experience is for his best interest.

Given, a case of asthenopia. Refract and allow sufficient time for a properly-adjusted correction to modify the muscle condition and relations of fixation. If the manifest heterophoria is not relieved and a latent error is still to be found, I at once begin a system of ocular gymnastics with prism, stereoscope and voluntary and prearranged manual of movements. Usually four office sittings and as many more home exercises interposed, will enable me to determine the range of flexibility of the ocular muscles under voluntary control. The power of abduction, adduction, sursumduction and torsion is now estimated. These data, together with the first readings, will usually enable me to state to the patient two propositions:

First: Will you place yourself under my care for from three to six months and submit to the course of ocular gymnastics and general tonic treatment, and do but a limited amount of close work; with the possible result of an improved if not corrected muscle balance, with a reasonable hope, if your general health remains good and the eyes are not overtaxed, that there will be no relapse; or, if there is a relapse, by again undergoing treatment, the balance may be again temporarily established. Or, second, will you prefer to put yourself under my care for from two to six weeks and undergo the development of the total error and have it corrected by operations and an orthophoric condition established, and thus do away with the error and, we hope, enable you in the shortest possible time to determine whether you can pursue your chosen vocation?

#### QUOTATIONS FROM AUTHORITIES.

David Webster said in closing an analysis of 40 cases in which he had operated by graduated tenotomy for heterophoria:

1. No person should have a tenotomy performed solely because he is the subject of heterophoria.
2. Very slight degrees should be corrected where troublesome symptoms exist which may be due to the too great use of nervous force on co-ordinating the eyes.
3. Other means should be resorted to before trying tenotomy, but unnecessary delay should be avoided.
4. Tenotomies should be performed under cocaine.
5. In judiciously selected cases, when the operation is properly performed, the average results will be quite as satisfactory as the results of most other surgical operations.

It is a mistake to deny that any good can come of a graduated tenotomy.

\* Read before the Western Ophthalmology-Oto-Laryngological Society, April 11, 1902.

It is always a mistake to claim that all of the ills that flesh is heir to are to be cured by cutting the muscles of the eye.

Hansell concludes from his experience "that tenotomy and not prisms is the treatment and that the tendon should be completely divided."

Goold gives still another point of view: "I can imagine nothing more 'bete,' more unsurgical or more unmedical than cutting the tendon of an overstrong muscle of the eye when the weak antagonist, by physiologic methods, may in a week, a fortnight or a month, have its strength increased five or six fold."

The foregoing conclusions are fair samples of the literature—and it is voluminous—from which we have had to glean our material, to place before you the status of operative interference for the correction of heterophoria. Stevens, Ranney and others—to judge by their writings—seem to be of the belief that heterophoria can only be corrected by a radical operation. The late Dr. Noyes and Drs. Hotz, Savage, Webster, Standish and many others are evidently of the opinion that a true heterophoria, while it may be made tolerable and under conditions of improved general health rendered latent, may become again manifest and annoying under sufficient provocation, either from continued use of the eyes or from impaired general health.

Apparent heterophoria may be due to errors of refraction or position and habits of work to correct these and by training and ocular gymnastics these errors may be corrected and the apparent unbalance disappear. In true heterophoria, while the error may be suppressed or latent, the strain resulting may be great but not as annoying as in manifest of error. A few cases may illustrate:

#### REPRESENTATIVE CASES.

CASE 1.—Mrs. X. came to me in 1893, suffering from headache, indigestion, insomnia and vertigo. She had been under careful general treatment. Her eyes were refracted under atropin and totally corrected, O.S. and O.D. + 1 + 1.25 cyl. ax. 90. After the cycloplegia had passed off, vision = 20/20. After some months she returned and I reviewed her eyes, as the asthenopia and headache had not been relieved, though she was dependent upon her glasses.

At the time of her first visit I made out a hyperphoria of 1 degree and decentered her glasses to correct it. Later she gave a right hyperphoria equal to 5 degrees, esophoria equal to 10 degrees. She remained under treatment for two weeks and the prism drill was thoroughly carried out, resulting in apparently normal R. and L. sursumduction and abduction = 40°, adduction = 4°. She returned to her home in a western town and for a time experienced some relief. Within six months she suffered a relapse, and, while she could not use her eyes with comfort with her glasses, she was helpless without them. She returned to me in 1901 much broken in health, manifesting 10° of right hyperphoria. This was corrected by operation with complete relief from all of her chronic symptoms. During the past two years she has recovered good health and is now entirely free from asthenopia. She has to regret the partial loss of nearly ten years of comfortable life and the lasting results of wear and tear upon her nervous system; and I have to regret the lack of courage of my convictions.

CASE 2.—Mr. B., aged 20, a student, consulted me in January, 1890. Examination revealed under atropin hypermetropia + .50, each eye. All of his symptoms pointed to eye-strain as the cause of almost constant headache, asthenopia and occasional migraine. A study of the muscle condition gave right hyperphoria 4°, but after manifest rest, prisms and gymnastics for two days, 8° with no lateral error. As he had been out of school three months and had worn a + .25 correction most of that time, I advised an operation as soon as the full amount of error could be determined.

The patient concluded, however, to delay the operation, and at my suggestion sought other advice. Ten months later he

reported again, that he had been under the treatment of a colleague, had worn prisms, done exercises, worked on a farm, had improved, attempted to study and had been at once prostrated by a series of severe attacks of migraine and had now returned for an operation, if I still considered it advisable.

A right hyperphoria of 7 degrees was corrected by two operations. After seven months of continuous school work he reports complete freedom from troublesome symptoms, though he has been doing double work during the past semester. I consider that this patient lost nearly a year by delaying the operation.

CASE 3.—A patient with an exophoria of 10 degrees, who reported to me lately, complains that he is able to do only half a day's work, though he has been under treatment for three years. He is unable, or thinks he is unable, to take a protracted vacation and change of environment. Rest prisms are of use to him in close work. He is 34 years of age and is emmetropic, but requires + 1.d. for close work; adduction 30 degrees, abduction 91 degrees. Adducting prism exercises cause pain and continued fatigue. The use of strychnia 1/30 t.i.d. for four days will bring his adduction up to 45 degrees and allow him to dispense with his reading glasses, but he soon becomes nervous, irritable and sleepless with high pulse tension. This is a case of functional esophoria and not operable.

#### THE CAUSE OF MANY FAILURES.

In looking over the literature on the subject, and in recalling the teaching which we received and the lack of importance attributed to the auxiliary structures, I do not wonder that a large majority of the operators who have not had the patience to go into the anatomy of the dynamic structures of the eye have met with failures in securing the results desired.

I have frequently been struck with the lack of accurate knowledge of these structures which is exhibited, and could not but wonder whether this lack of knowledge might not have entered into the question of their operations and modified their results. Some of the most strenuous opponents of graduated tenotomy admit that in certain cases the only relief for heterophoria lies in an operation, and they resort to the uncertainty of a complete tenotomy. They know that in this manner they can correct the error, but it seems to me they are in danger of establishing another and greater error in the opposite direction.

Prism exercises are of curative value only in cases of functional heterophoria. With them, you can teach the muscles the trick of voluntary control.

In many cases of heterophoria from structural causes, the prism drill will enable the patient to control the imbalance during favorable conditions, but as soon as they are innervated the voluntary control is relaxed and asthenopia or reflex symptoms result. In any case, all that we can hope to do is to correct the heterophoria and then, if the reflex conditions are due to it, expect a gradual improvement.

#### RESULTS OF OPERATIONS.

The method of operation will be determined by the location and the degree of the error.

The amount of correction obtained from a given operation will vary according to the carefulness of the operator, both as to surgical deftness and asepsis.

The breadth of the annular ligament and the character of its fibers will determine the extent of the operation and the amount of displacement secured.

In my experience in exophoria I have been able to secure as high as 10 degrees by a single operation; on account of the narrowness of the expansion of the tendon, I have, in another case, been limited to 4 degrees; in esophoria, as high as 15 degrees and as low as 3; in hyper- or hypo-phoria, as high as 7 and as low as 1.

I will refer you to the interesting work of Savage and the later writings of Stevens for data or opinions relative to the correction of cyclophoria by a partial tenotomy. My cases are too few and recent for me to express even a tentative opinion.

#### THE CHOICE OF AN OPERATION.

The question to-day does not seem to be whether an operation in certain cases is good practice, but what form of operation shall be employed, the partial or the guarded tenotomy or an advancement. For my part, I prefer a partial tenotomy and an advancement if the error is of too high a degree to be corrected by a partial tenotomy alone, for in this way you conserve the guy strings of the tendon.

A class of cases claim our attention in which the experience of the surgeon who has dealt with a large number of cases of heterophoria is of great value. This class is composed of cases of asthenopia or supposed ocular reflex neuroses in which there are errors of refraction and hyperphoria, in which the errors of direction are marked and constant. Shall we say to these patients, we will correct the anomalies of refraction and then after some months correct the muscle errors if your trouble does not disappear, or shall we at once proceed to the correction of both forms of error and thus save much valuable time; for to certain patients it may mean the discontinuance of a course of study, or a protracted interruption, the loss of a position or a repetition of an expensive journey with its uncertainties. There is also the consciousness, on the part of the adviser, that it is only a question of time when the error must be corrected and that the delay was not only unnecessary but a concession, not to conservatism, but to the opponents of a legitimate procedure.

The opponents of the operation offer no valid reason why the operation should not be performed and those who allege that the operation can not be done as a legitimate partial tenotomy so as to secure a result, are so small in number and so evidently voicing preconceived opinions of others who have never undertaken the study of the technical difficulties of the operation, that their opinions are of but little value.

On the other hand, any radical procedure of the nature of an operation involving the disturbance of such nice adjustment as binocular fixation, should not be lightly considered, nor should the enthusiasm of success in a limited experience lead those who favor the operation to advocate it as the "cure all."

#### CONCLUSIONS.

It is true that the operation for a few years following the publication of the first reports of cases by Stevens, Ranney, Standish and many others, was employed for the cure or relief of all sorts of conditions, of necessity there was a reaction, but through the careful and legitimate employment of the procedure in properly selected cases, it has taken its place as second only to refraction in relieving certain forms of eye strain, and is practiced by conservative ophthalmologists.

In whichever class we may find ourselves after a careful investigation of the subject, we must give due credit to the personal equation and the perfection of detail and technical accomplishment of our opponents. In either case we must give credit to the honesty, experience and observation of our colleagues, for in given cases each class may be correct.

The most that any one of us can say is that, in my hands and from my experience, the methods which I follow give the best results.

## Clinical Report.

### ANEURISM OF THE INNOMINATE ARTERY.

REPORT OF CASE SUCCESSFULLY OPERATED ON.\*

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The patient, F. W. F., is a railway switchman by occupation and is 45 years of age. About March 5, 1901, he noticed a soreness over the right side of his chest and his right shoulder. This soreness gradually grew worse and extended to and involved the right arm. He consulted a physician at that time, who made a diagnosis (?) of "rheumatism" and treated him until Aug. 28, 1901.

His condition steadily growing worse, he decided to change physicians, and he called in Dr. Hiram A. Wright on Aug. 29, 1901. Dr. Wright made a careful examination of the seat of the trouble and made a diagnosis of aneurism of the innominate artery. He asked me to see the case with him the following day. I did so and, on examination, found what the doctor had correctly diagnosed. There was a marked bulging of the right half of the sternum and of the first three ribs on the right side and there also was a pronounced pulsating bulging at the origin of the right sterno-mastoid muscle. The integument over the tumor and the adjacent area presented a markedly cyanosed appearance. The patient at this time was in severe pain a large part of the time; suffered from dyspnea; could not sleep; had no appetite; was coughing a large part of the time, and was able to walk only with difficulty. His heart's action was very weak, rapid and intermittent. Auscultation revealed a pronounced aneurismal bruit or thrill. This was discernible, not only over the pulsating tumor, but also over the course of the right common carotid artery.

The extreme gravity of the situation was explained to the patient, and the small chance of a successful termination, even if operation was attempted. He replied that, as certain death in a very few days stared him in the face without the operation, he was willing to take any chance to gain a longer lease of life.

He entered St. Mary's Hospital, in this city, on September 3, and I operated the following morning. Chloroform anesthesia was employed during the whole operation. An incision five inches long extending parallel with the clavicle, outward from the sterno-clavicular junction, was made, and the upper part of the aneurism, the root of the common carotid artery, exposed. The aneurism was found to be the size of an egg, only more rounded. I decided to ligate both the common carotid and the sub-clavian arteries, in the hope that the sac would fill with clotted blood which would later become organized, and the life of the patient thereby prolonged. The carotid was tied a half inch above the sac, while the subclavian was ligated at its outer third with strong dry-sterilized catgut. The wound was closed with a buried continuous catgut suture and the skin was approximated with sterilized adhesive plaster strips.

The patient reacted well; there was no disturbance of cerebral circulation, and there was no swelling of the right arm. He made a perfect convalescence and was allowed to sit up at the end of the third week. At the end of four months he was in better health than for several years, and to-day walks to and from his office (a distance of four and one-half miles). There was some atrophy of the right arm, but at the fourth month the radial pulse again became established and the arm is to-day as large as ever. At present he is engaged in office work, it being deemed unsafe for him to do any such exhausting labor as was the case in his previous occupation, rail-roading.

Of the thirty-six cases of innominate aneurism operated on by the simultaneous ligation of both sub-clavian and common carotid arteries, which I have found reported in this country, nine complete recoveries are noted.

In the case personally reported it might be of interest to note that a fluoroscopic examination of the patient five months after operation revealed a solid mass, almost opaque to the rays, somewhat smaller than an egg, and occupying a position corresponding to that which was formerly occupied by the aneurism. Dulness can be elicited over this area upon percussion, while inspection fails to reveal any bulging, or in fact, anything abnormal, except an almost imperceptible scar.

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\* Patient exhibited and case reported before Detroit Medical Society, May 21, 1902.