

grasped with fixation forceps by an assistant and brought forward to relieve the strain on the suture. When the suture is made taut, the knot is tied. No conjunctival suture is necessary.

254 S. 16th Street.

TENDON ADVANCEMENT AND TENDON RETROPLACEMENT.

Read in the Section on Ophthalmology at the Forty-sixth Annual Meeting of the American Medical Association, at Baltimore, Md., May 7-10, 1895.

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Reference is here made to advancement of tendons as distinguished from tendon resection or tendon shortening. In the latter two, the stump of the partially severed tendon furnishes the point of attachment of the portion to be brought forward. Not so, however, in tendon advancement. This operation is required as a remedy for strabismus, insufficiencies, and for the results of old operations excessive in their effects. Tendon retroplacement is here recommended as a control procedure, in connection with complete tenotomy, and is to be practiced at the time and as a part of the original operation.

It may as well be said at once that in the opinion of the writer, the operation for tendon advancement, as described by Stevens and performed with the singularly delicate instruments which he has given us, may be substituted with advantage for all other operations heretofore described. The small conjunctival opening with its minimum of integumental traumatism, the almost total-subconjunctival location of the sutures, the unirritating character of the sutures owing to their small size, the ease and exactness with which it may be practiced, and the freedom from after-irritation during the process of healing leave little to be desired.

In a single particular only has any modification of Stevens' method seemed advantageous and that relates to the location of the stitch making the attachment to the globe. The conjunctival stitch which he recommends having occasionally failed, I have sometimes made a sclerotic attachment not involving the conjunctiva. A very small curved needle carrying the 000.000 thread of Stevens' is passed through the center of the extremity of the tendon to be advanced from without inward, and is carried forward to a point within the region denuded by the conjunctival incision and at the point selected for the attachment of the tendon and back of its original insertion. The needle is now made to enter and traverse the superficial layers of the sclerotic, tunneling a distance of 1 or 2 millimeters in length and barely deep enough to make a firm hold, the firmness of which hold may be tested after the emergence of the point of the needle by a lifting motion at the hand of the operator. The result is the tacking down of the tendon in a perfectly definite way to tissues of sufficient firmness to maintain the fixation of the parts involved until healing shall have taken place.

It is to be expected that the result obtained at the time of operation will closely approximate the result finally reached. I have frequently found a difference under these circumstances of not more than 1° or 2° . The usefulness of such an operation in cases of old post-operative deformities is manifest.

Tendon retroplacement is in a certain sense a control procedure applicable in tenotomy where accurate

dosage is essential. In such cases, it not infrequently happens that section of a tendon less than complete severance fails to produce a sufficient result, while a complete section results in an excess. For example: in a lateral heterophoria of 15° in each eye, not more than 8° or at most 10° can be obtained by partial section—an insufficient correction. A complete section may result in 20° to 25° of effect—an over correction. Under such conditions, the correction may be made quantitatively exact by first making the complete section and then at once advancing the tendon to the proper point, there tacking it down. If we endeavor, as I think most of us do, to make our corrections in equal quantities on both eyes, this procedure will be found not infrequently useful, at times indeed indispensable.

It will be seen that this, considered as a control procedure, differs radically from that often employed, in that the large conjunctival wound and the conjunctival suture are here discarded.

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THE INDICATIONS FOR, AND THE ADVANTAGES AND TECHNIQUE OF, MUSCLE SHORTENING.

Read in the Section on Ophthalmology, at the Forty-sixth Annual Meeting of the American Medical Association, at Baltimore, Md., May 7-10, 1895.

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In the judgment of the author of this paper, muscle shortening is indicated in all cases of heterotropia, regardless of the direction or extent of the turning. In many cases of low degrees of squint the shortening operation alone will effect a cure; while, in a greater number of cases, the shortening of the weaker muscle should be associated with a partial division of the tendon of the stronger muscle in order to the attainment of the best results. In cases of high degree of exophoria in which a partial tenotomy of both external recti does not reduce the exophoria within the range of possibility of completing the cure by rhythmic exercise of the interni, the latter should be shortened. In all cases of exophoria with less than 8° of abduction, shortening of the interni is indicated, not to be associated with even the slightest tenotomy of the externi. In high degrees of esophoria not reduced by a partial tenotomy of the interni within the limit of possibility of completing the work by exercising the externi, the latter should be shortened; while in the lower degrees of esophoria, the only operation indicated is the shortening of the externi. In any case of hyperphoria not reduced to 2° or less by a partial tenotomy of the superior rectus of the hyperphoric eye, the inferior rectus of that eye should be shortened. In all cases where shortening is indicated, except in hypertropia and hyperphoria, the operative effect should be equally divided between the corresponding muscles of the two eyes. The superior and inferior recti of a cataphoric eye should be operated on rarely if ever. Since the shortening of the recti muscles, associated with partial tenotomies of the opposing muscles can effect so much, a complete tenotomy of an ocular muscle can not be often indicated.

THE ADVANTAGES OF SHORTENING

a muscle, over the older method of muscle advancement, may be set forth in a few words: the former is more easily done, and is the safer of the two opera-

tions, in that torsion of the eye is not so likely to occur as a result of setting the tendon too high or too low, in case the externi or interni are the muscles involved, or too far out, or in, when the superior and inferior recti are the muscles in question. Should the knot come untied in the shortening operation, the patient's condition will not be worse after the operation than before, which can not always be said when the same thing happens in the attempt to advance a muscle. An apparent objection to the shortening operation is the knuckle of the muscle formed by the folding, but this disappears by absorption within a few weeks.

THE TECHNIQUE OF MUSCLE SHORTENING

was simple when first introduced, but has grown in simplicity as a result of a modification suggested and practiced by Dr. Tenney, of Boston. The original operation was performed as follows: the eye was cocainized; the lids were separated by a speculum; the conjunctiva was seized with fixation forceps a little behind the insertion of the muscle tendon, and two cuts with scissors were made, one vertical the entire width of the tendon and a little behind the insertion; the other below and parallel with the lower border of the tendon and muscle. The included portion of the conjunctiva was then dissected up and held out of the way. A puncture of the capsule of Tenon was next made, at the lower border of the tendon near its insertion, and another puncture at a corresponding point at upper border of the tendon, through which a strabismus hook was passed beneath the tendon, with which to control the eye. A silk thread was then armed with two needles, one of which was passed through the upper part of the muscle and capsule from without in, at a chosen distance behind the insertion, and, similarly, the other needle was passed through the lower part of the muscle and capsule at a point immediately in line with the first. Drawing on the two ends, a loop of thread was brought in contact with the capsule over the muscle. The passage of these needles was facilitated by lifting the respective borders of the muscle with fixation forceps. The next step of the operation was to lift the tendon by means of the hook and pass, first one needle and then the other, through the tendon from within out, at points one-eighth of an inch apart, bringing these needles out through the conjunctiva, a little in advance of the tendon insertion. The two needles were now removed and, by means of the surgeon's knot, the part of the muscle beneath the loop of thread was drawn up to the insertion of the tendon, thus shortening the muscle to a corresponding extent. The flap of conjunctiva was now allowed to fall down over the knuckle of muscle. The stitch thus taken was allowed to remain from four to six days, at the end of which time the muscle was firmly fixed, by adhesive inflammation, in its new relation.

The modification suggested by Dr. Tenney, in a personal letter, I at once adopted. As thus modified the operation is done as follows: a horizontal cut is made with scissors through the conjunctiva and capsule of Tenon, beneath the lower border of the muscle from the insertion of the tendon backward, to the extent of the shortening desired. Through this cut two strabismus hooks are passed,—one beneath the tendon at its insertion; the other beneath the muscle. By means of these hooks the muscle is lifted from the sclera. A needle is now passed through the con-

junctiva and the upper border of the tendon at its insertion and is carried back beneath the muscle to a point chosen just in advance of the second hook, where it is made to penetrate the muscle near its upper border and the superposed capsule and conjunctiva. The needle is then made to reënter the puncture in the conjunctiva made by it in its exit, is directed downward between the conjunctiva and the capsule and is brought out through the incision in the conjunctiva. Then the lower border of the muscle and capsule are seized with forceps and this needle is made to penetrate them from without in, and is again brought out through the horizontal incision. The needle is now passed through the incision beneath the tendon which it is made to penetrate at the lower border of its insertion and is brought out through the conjunctiva at a point in line with, and one-eighth of an inch below, the primary puncture. The two ends of the suture thus passed are now brought together by a surgeon's knot with enough force to bring the part of the muscle beneath the loop in contact with the tendon. The suture is allowed to remain from four to six days.

The suture plate, recently introduced by Dr. Chalmer Prentice, of Chicago, as modified and improved by Dr. George H. Price, will most likely be of much service in this operation, if for no other reason than that it will greatly facilitate the removal of the suture. The improved plate is made of aluminum, is five-sixteenths of an inch long and one-eighth of an inch wide, oval in shape. In this plate there are two holes one-eighth of an inch apart, through which the two ends of the suture are passed. In tying the suture, the plate, which has such a concavity as to fit the curvature of the eye, is brought in contact with the eye, and the knot is tied over it between the two holes. There is a transverse groove near one hole along which one blade of the scissors is passed when the suture is to be removed.

SLIGHT EFFECTS OF TENOTOMIES OF THE OCULAR MUSCLES, AND WHAT ARE THE INDICATIONS AND ADVANTAGES OF TENDON CONTRACTIONS?

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1. *Technique of Tenotomies.*—I have placed my views so clearly on record respecting the general technique of tenotomies that it does not seem necessary to repeat what I have said. There remain for discussion these two questions:

1. Why are slight effects produced as the result of free tenotomies of the ocular muscles?
2. What are the indications and advantages for muscle shortening?

In regard to the first question, the slight effects sometimes resulting from free tenotomies, I shall venture the assertion that a tenotomy uniformly produces all the effect which we have a right to expect from it. If we hope to produce a definite effect, by operating on a muscle which is not the chief element in the condition for which we operate, we may expect disappointment. In other words, we shall not get the effect for which we hope, if we operate on the wrong muscle.