THE CINCH OPERATION*

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THE object of this paper is to bring the technique and applications of the cinch operation up to date, because descriptions in all the text-books (except Chavasse, 1939) are so incorrect as to discourage any interest in it. Because of its positive nature the cinch cannot be used as a substitute for shortening operations dependent on sutures, and hence the user should not think in terms of such methods.

This operation was first reported 43 years ago (O'Connor, 1912), and a second paper reported my first 42 operations (O'Connor, 1916).

The advantages of this method are these:

- (1) It enables the widest possible range of loop-shortenings to be carried out.
- (2) No sutures are used.
- (3) The tendon is not cut.
- (4) The shortening is straightforward.
- (5) Post-operative loss cannot occur at the point of shortening.
- (6) Binocular occlusion is not required.
- (7) In many cases monocular occlusion is unnecessary especially with the vertical muscles.
- (8) Post-operative movement is encouraged to prevent scleral adhesions.
- (9) Confinement to bed, house, or hospital is unnecessary.

Application

(1) *As a tendon shortening* whenever such an effect is indicated. Chavasse (1939, p. 557) states:

The operator has a sense of security and confidence greater than that afforded by any other method of shortening.

(2) *As a non-slipping anchorage* whenever a tendon suture is needed as in advancements and transplantations (Fig. 1), and as a guard in complete tenotomy (Fig. 2).

When it is to be used as a suture, a single-over loop is placed just behind the insertion of the tendon which is then *shaved from the sclera*. The loop cannot pull out through the dense area of the insertion. This method is also useful with tendons separated in retinal detachment operations.

Operative Technique

- (1) The incision is made just in front of the insertion and parallel to it.
- (2) The conjunctiva is undermined in all directions.
- (3) A nick is made at one tendon margin exposing the sclera.
- (4) The right-angled hook is slid under the tendon just behind the insertion and another nick is made at the other margin.

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FIG. 1.—Cinch of one half of tendon in certain transplantations.

FIG. 2.—Guard suture in complete tenotomy. *a, a* are tags of insertion. A single-over cinch of tendon uses two strands of No. 1 silk. The respective ends are brought through corresponding tags and conjunctiva, and are tied over a piece of catgut laid parallel to the insertion.

- (5) Both margins are completely cleared back to the muscle tissue.
- (6) The tendon is fully exposed by removing all over-lying subconjunctival tissues—preferably as a flap.
- (7) The tendon is split with a small sharp hook into a number of strips, the number depending on the make-up of the tendon and the effect desired. A frail tendon calls for fewer strips, for it is essential that each should contain enough tissue to give the shortening desired. The point of the sharp hook enters immediately behind the other and is carried backward to avoid a painful pull at the origin of the muscle. The split should not extend forward through the insertion to the sclera because the roll of shortening must lie as far back as possible. *If the roll is placed just behind the insertion it may adhere to the sclera and cause a recession equal to the diameter of the roll, so lessening the final effect.*
- (8) The nylon shorteners, in a specially prepared carrier, must be passed exactly as shown in Fig. 3. This should be practised on a string model before the operation is undertaken. The carrier must be passed *over* each strip of tendon so that when finished, the roll of shortened tendon will be on its upper surface. If the carrier is passed *under* each strip the roll will be on the under surface and may cause harm by pressure on the sclera. The direction must be reversed on each succeeding tendon strip in order to keep them at right angles to the tendon (see Fig. 3c).
- (9) Using a special forceps, such as Hosford's, to encircle the nylon at one tendon margin, the loops are transferred by gentle traction against its counter-pressure. Very often the spring in the nylon does this to each strip on the way across the tendon.

FIG. 3.—(a) Single-over.
(b) Double-over.
(c) Result if direction of loops is not reversed.

FIG. 4.—Appearance after transfer of loops.

(10) The loops are slid into close contact and the nylons are arranged parallel to each other (Figs 4, 5, 6).

(11) Any loose tissue that may be drawn into the roll should be separated fully, leaving the surface and margins of the tendon clean. *This is a very important point in the technique.*

(12) In dealing with the horizontal muscles, the lower ends of the nylons are cut about 4 mm. from the tendon margin to be buried by the conjunctival suture. The upper ends are cut long enough to lie deep in the upper fornix reaching almost to the opposite canthus. Many years ago I could have made a success of silk-worm gut had I thought of this trick which I learned from Hosford. In dealing with the vertical recti the inner ends are buried.

(13) The conjunctiva is sutured by a continuous suture using 5-0 plain cat-gut.

(14) On or about the 21st day the nylons are removed one by one against the counter pressure of a small hook at the tendon margin.

Nylon is somewhat harder to place than dermal suture material; but, because of its stiffness and unchanging make-up, it gives much better results.

FIG. 5.—Cinch of central portion:

- (i) as in Motais transplantation;
- (ii) increasing effect of a central tenotomy.

FIG. 6.—Same stage as Fig. 5.

Kinds of Loops

(1) *Single-over* (Fig. 3a), usually with many strands of 2-0 nylon, is used:

- (a) in low phorias, especially the vertical, where an over-effect must be avoided and the result accurately graduated*.
- (b) in pure convergence insufficiency*.

In both cases I use as many nylons as I think will give an immediate over-effect, and this is tested at once. This immediate over-effect is reduced at once by removing the nylons one at a time with Maddox tests between till the over-effect is reduced to 4^Δ . Both eyes are left open and positive instructions given to use them "as usual"; the vertical cases are especially told to practise vertical rotations. If these instructions are carried out, the over-effect is usually gone by the next day—if not, one or more additional strands of nylon can be removed as needed. If these instructions are not given, or acted upon, the patient is apt to close both eyes, in which event they roll up and adhesions form between the cinch roll and the over-lying tissues to hold the eye much higher than the immediate effect. This happened in one of my early vertical cinches and called for a second operation to separate the adhesions. Care must be taken *not* to shorten a superior rectus so much that use of the eyes in the reading position is interfered with. For this reason it is unfortunate that, in most vertical deviations, it is the superior rectus that needs shortening.

(2) *Double-over* (Figs 7, 8, 9).—I usually use this in squints and high phorias. Four strands of 2-0 nylon and two strands of 1-0 nylon give approximately 6 mm. of shortening, which, in my opinion, is all that should be taken out of a total muscle length of 41 mm. This is especially so when there will be no loss from slipping of the stitches since stitches are not used in this operation.

FIG. 7.—Double hitch to marginal strips.

FIG. 8.—Double hitch after transfer. (a-b) shows amount of shortening.

FIG. 9.—Double hitch to one margin showing tendency to correct a cyclophoria. By cutting the other tendon margin the effect of Steven's extendo-contraction is secured.

*Most patients are old enough to be operated on under local anaesthesia.

(3) *Double-hitch to each margin* (Figs 8 and 9).—The central section can be advanced, resected, tucked, or treated according to the La Gleyze scheme, and all sutures used should be free from tension. I have had perfect results simply by placing the central section forward on bared sclera with no sutures whatever. This proves the perfect support afforded by the marginal shortenings (O'Connor, 1916).

Amount of Shortening.—This depends on:

- (1) *Size and Number of Nylons*
- (2) *Use of Single- or Double-over Loop*
- (3) *Width of Tendon Strip.*—In operating on low phorias and insufficient convergence, where accurate gradation of effect is essential, many narrow tendon strips and many strands of 2-0 nylon, with the single-over loop, are used.

TABLE
RESULTS WITH 3-0 CATGUT

No. of Strands	Nylon	Loop	Shortening
8	2-0	single-over	4
1	2-0	double-over	4
2	2-0	double-over	5
4	2-0	double-over	6
2	1-0	double-over	6

The Table shows that a great part of the shortening is comprised in the loops themselves, and that the nylons serve in great part to prevent reversal of the loops. Scobee (1952) states however that the amount of shortening is proportionate to the number of strands used. In fact it is not even proportionate to the diameter of the bundle (Fig. 10).

Very often less shortening has more effect because rotation occurs instead of retraction.

A permanent over-effect is very rare unless the opponent has been recessed or completely severed, neither of which is correct with such a positive shortening (see opening paragraph).

Many years ago I learned that it is not necessary to increase the shortening in proportion to the angular deviation. So I stopped bothering with such measurements. The right operation on the muscle at fault at the right time is the first requirement, and it should be done before the occurrence of secondary changes that may entail theoretically incorrect operations. *No one bothers about the angular deviation when lenses alone cause it to disappear. Operative work as above noted has the same result.* These ideal results cannot be secured by operating on muscles that are not at fault,

FIG. 10.—Shortening on drills showing that amount is not proportionate to diameter of material.

as for example by cutting an inferior oblique that is overacting because of underaction of the opposite superior rectus. The following examples prove this point:

(a) In a case of esotropia with underaction of the superior rectus of the *fixing* eye, a cinch of this muscle as the only operation permanently cured the esotropia (O'Connor, 1923).

(b) A case of exotropia had a vertical deviation of 23^{Δ} due to an underacting superior rectus, which, when cinched, gave permanent orthophoria in both directions.

These double deviations are even more frequent in the lower degrees of disalignment; they show the importance of operating on the muscles at fault and not by "rule of thumb".

In all cases possessing binocular vision, and in those in which it is hoped to develop it, normal action of the opponents must be preserved in order to achieve normal convergence and parallelism in all directions of gaze.

Reactions

All the text-books, excepting Chavasse (1939), state that reactions are severe and convalescence prolonged. The possible causes of reaction in order of frequency are these:

(1) *Rough surgery*.—When an operator takes from 1 to 3 hours to do an operation as simple as the cinch he must have made a mess of it.

(2) *Too much shortening material*.—This means the presence of too much foreign substance.

(3) *Orbital anaesthesia of the muscle*.—I never use it.

(4) *Allergy*.—I have experienced allergic reactions to mercurial compounds, antibiotic ointments, and even to the nylon itself.

(5) *Irritating conjunctival irrigations*.—I never use them.

FIG. 11.—Appearance 2 days after operation, showing lack of reaction.

- (a) Cinch of right superior rectus.
- (b) Cinch of left external rectus.
- (c) Cinch of left inferior rectus.

FIG. 12.—Cinch of external rectus 24 hrs after operation showing lack of reaction.

(6) *Stitch Infection*.—This is quite rare but does occur. The following preventive precautions are routine:

(a) No operation during or for at least 2 weeks after complete recovery from a respiratory infection. Even this is not 100 per cent. safe because operation may be done during an incubation period which is probably the most infectious.

(b) Aureomycin in the eye to be operated four times a day starting 4 days before the operation. If the patient turns out to be allergic to this antibiotic some other should be used.

(c) Operation performed through an opening in a rubber dam mounted on the speculum blades. This protects the nylons from lids and lashes.

(d) No irrigations of any kind, in order not to destroy the lysozyme in the tears.

(e) Nylons sterilized in the autoclave and kept in hot water till used.

(f) Nylons are anointed with full strength aureomycin ointment just before using.

Discussion

It should be emphasized that, in the phorias, the operation should be done to relieve symptoms, not merely to change measurements; many show deviation but no symptoms. A proper study of the case should settle the matter, and the patient is entitled to know that a safe operation on the muscle at fault will give relief from his troubles. An ophthalmologist who has not interested himself in the surgery of muscles should not conceal the possibility of such treatment from the patient, but I have known some such who have even gone a step further and warned their patients against "muscle operators".

Chavasse (1939) wrote in support of the cinch operation as follows:

(p. 557), the standard of constancy of technique attainable is higher than with any other method of shortening . . .

(p. 614), the rather slight advantages attending a successful resection are so overshadowed by the more solid merits of cinching that resection will seldom be used by the operator who has had extended experience of both . . .

(p. 616), a tucking, if successful*, can be made to give a slightly greater effect than that obtainable by the more dependable operation of cinching.

Barkan praised the cinch method as follows:

I never had an operation that I knew would give definite results and would lack the element of worry until I had done the O'Connor operation (Barkan, 1931). . .

It is an error *not* to use the cinch when a shortening effect is desired (Barkan, 1936).

McCool (1931) also commended its use:

The O'Connor operation comes nearer the ideal in muscle shortening than any with which I am familiar.

More recently Sharpsteen (1950) expressed the view that this procedure is accurate and safe and entails a minimum of post-operative disability, the only difficulty having now been eliminated by the introduction of nylon shorteners. He enumerated the following advantages of the cinch operation:

- (1) The tendon is not cut.
- (2) No sutures are required except in the conjunctiva.

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*Note the use of the phrase—"if successful".

- (3) The shortening is entirely within the tendon.
- (4) No change in the shortening can possibly occur until the shorteners are removed or unless they are removed before the two weeks are up; the loops have become so fibrosed that no slipping can possibly take place.
- (5) Bandaging the eyes following surgery is not necessary.
- (6) Even monocular bandaging is unnecessary and many times undesirable.
- (7) There is little or no disability except that attendant upon the anaesthetic. In other words, children can go home the same day from the hospital, and adults, done under local anaesthesia, may go home immediately following the operation.
- (8) Because of the position of the cinch, no adhesions form to the sclera back of the insertion.
- (9) Finally, a maximum shortening equal to the length of the tendon can easily be attained.

Summary

The advantages of the cinch operation and indications for its use in the correction of strabismus are described.

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