RECESSION-LENGTHENING OF MEDIAL RECTI FOR
CONVERGENT SQUINT*
A PRELIMINARY REPORT

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Text-book examples of strabismus fixus and of the retraction syndrome are not commonly encountered. Abnormal medial recti, however, showing some tendency towards the fibrosis or muscular thickening characteristic of such conditions, not uncommonly appear when ordinary squints are operated upon.

Abnormal medial recti are usually found in congenital convergent squint. In most such cases there is limited abduction, suggesting paresis of one or both lateral recti, but, when operation is performed, it is usually so difficult to abduct the eyes by pulling with forceps that it becomes obvious that not even a normal lateral rectus could overcome the resistance of the abnormal medial recti. On severing the medial recti from their scleral insertions it is common to observe a divergence, proving activity of the lateral recti which had been presumed to be paretic, or under-developed.

Bilateral recession of these thick, inextensible medial recti does not give sufficient correction. Resection-advancement of the lateral recti can help, but really good surgical results are not always to be expected in congenital convergent squint when these well-established operations are performed.

Better results in such cases have been obtained since adopting the operation of medial rectus recession-lengthening. This operation was designed to weaken the over-strong medial recti so that they matched, more or less, the weaker lateral recti; at the same time the fibrous contracture was to be mitigated, thereby giving the weak lateral recti a chance to contract effectively.

I first tried this operation 4 years ago and it is now my intention to give a preliminary account of the operation and (in general terms) of the results obtained during the last 4 years.

Satisfactory results were obtained from this operation, no lateral rectus advancement or resection being required as a rule in cases of congenital convergent squint. Encouraged by these successes, the same operation was applied to other squints where the medial recti were found to be thickened or fibrosed, and good results have usually been obtained. The operation can succeed in most cases where the medial recti are relatively much too strong or active compared with the lateral recti, with or without fibrous contracture.

Operation

Indications.—These fall into two groups, clinical and operative. In most cases the former should be confirmed by the latter at the time of operation.

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(1) Clinical
(a) Congenital convergent squint with restricted abduction of one or both eyes.
(b) Paresis of lateral rectus with secondary contracture of medial rectus.
(c) Convergent squint of notably variable or capricious angle, not adequately controlled by spectacles, with small minimum angle and maximum angle at least 20° greater than the minimum.
(d) Powerful spasmodic convergence.
(e) Marked convergence with limited abduction—comparable with (a).

(2) Operative
(i) Perfectly straight eyes, when general anaesthesia has been induced, favour internal recession-lengthening though not a definite indication.
(ii) Thick, fleshy, over-strong medial recti.
(iii) Muscle-fibres of medial recti replaced noticeably by firm fibrous, tendinous, tissue.
(iv) Combination of (ii) and (iii).

CONTRAINDICATIONS

(1) Angles of squint never exceeding 20° with full range of movements.
(2) Concomitant squint with fixed angle of convergence and full range of movements.
(3) Maximum convergence not 20° greater than minimum angle, with full movements.

TECHNIQUE.—Both eyes are normally operated upon, except in slighter cases when one eye has simple medial rectus recession and the other has recession-lengthening.

Instruments.—As for simple medial rectus recession, plus one pair of large curved artery-forceps and one MacDonald's dissector (periosteal elevator).

Anaesthesia.—Preferably general.

The medial rectus is freely exposed, the conjunctival flap being retracted by a suture. Tenon's capsule is separated from the muscle as far posteriorly as possible; this dissection is completed by closed 2/3-toothed "lion-claw" forceps in the right hand along with MacDonald's dissector in the left hand. The assistant holds the medial rectus taut with a squint-hook but is instructed to avoid pressure on the globe whilst so doing.

The medial rectus is exposed to view using MacDonald's dissector as a retractor and speculum, and the curved artery-forceps are applied carefully to the muscle as far posteriorly as possible, so as to crush two-thirds of the width of the muscle. Extreme pressure is applied to the forceps for some 30 seconds, and then the instrument is removed and (except in certain cases to be mentioned below) re-applied to the muscle from the opposite border half-way between the insertion into the sclera and the first crushed area. Crushing is repeated at this position, again including two-thirds of the muscle's width in the forceps. The artery-forceps used for this procedure soon become useless for their intended purpose owing to weakening and looseness caused by such strong and sustained gripping. If less vigorous crushing is employed there is a risk of severe bleeding which cannot be
properly controlled, when the myotomy is performed (Fig. 1).

Catgut sutures are then placed as for a normal recession.

MacDonald's dissector is then held, as before, so as to give good vision whilst curved scissors are used to perform, firstly, the posterior myotomy, secondly, the anterior myotomy. The catgut is watched and guarded by the assistant, who is also still holding the squint-hook.

The myotomies must be made strictly within the crushed areas of the muscle, otherwise bleeding will be excessive and prolong the operation. They should sever 40 to 60 per cent. of the width of the muscle according to the degree of correction required, and the myotomies must be adequately spaced. The anterior myotomy should be 7 or 8 mm. behind the insertion, and the posterior myotomy should be 7 or 8 mm. behind the anterior (Fig. 2).

A little bleeding often occurs but should be ignored, and the tenotomy performed flush with the sclera. No stump should be left as this is wasteful and unnecessary. Swabbing away the blood, a search is made for persistent bleeding-points, which, if present, are touched with the heated probe. Bleeding from the muscle should not persist, but may call for a wafer of haemostatic material in a case where technique has been faulty as regards the myotomies.

The catgut sutures are then placed so as to give 4 or 5 mm. of recession, in the usual manner, and tied.

The Tenon's capsule is freed from the suture-points if necessary and smoothed into position.

A continuous black silk suture then closes the conjunctiva.

The conjunctival fornices are swabbed free of clots, and the other eye is then operated upon.

Guide to Amount of Myotomy.—Where the muscles are fleshy and strong, but not appreciably fibrosed, and, therefore, when careful clinical examination fails to detect any restriction of abduction, the Table (opposite) gives a scheme which usually works out satisfactorily. It should be taken as an approximate guide only. The minimum angle of squint indicates what to do to the lateral rectus or recti, provided no limitation at all is detectable in abduction and provided no contracture or fibrosis is found in either medial rectus. If there is the slightest limitation of abduction or if noticeable fibrosis is found in the muscles I avoid touching a lateral rectus and increase, somewhat, the myotomies.

No rule can be suggested for cases with marked contracture by fibrous tissue. In young children with convergent squint of congenital type and of severe degree I do as much to weaken the medial recti as appears both possible and safe. Two myotomies cannot be safely performed in small eyes, and one myotomy of about
TABLE
GENERAL PLAN OF OPERATION. CASES FREE FROM CONTRACTURE

<table>
<thead>
<tr>
<th>Angle of Convergence</th>
<th>Recession Medial Rectus</th>
<th>Myotomy</th>
<th>Resection Lateral Rectus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min.</td>
<td>Max.</td>
<td>mm.</td>
<td>Eye</td>
</tr>
<tr>
<td>0</td>
<td>15</td>
<td>4 or 5</td>
<td>both</td>
</tr>
<tr>
<td>0</td>
<td>20</td>
<td>5</td>
<td>one</td>
</tr>
<tr>
<td>0</td>
<td>25</td>
<td>5</td>
<td>both</td>
</tr>
<tr>
<td>0</td>
<td>30</td>
<td>5</td>
<td>both</td>
</tr>
<tr>
<td>0</td>
<td>35</td>
<td>5</td>
<td>both</td>
</tr>
<tr>
<td>0</td>
<td>40</td>
<td>5</td>
<td>both</td>
</tr>
<tr>
<td>0</td>
<td>45</td>
<td>5</td>
<td>both</td>
</tr>
<tr>
<td>20</td>
<td>35</td>
<td>5</td>
<td>both</td>
</tr>
<tr>
<td>20</td>
<td>45</td>
<td>5</td>
<td>both</td>
</tr>
</tbody>
</table>

66 per cent. and maximal recession is all that can sometimes be done to the medial recti in such cases.

DANGERS OF RECESSION-LENGTHENING.—The performance of more than a two-thirds myotomy must be avoided at all costs, as must the performance of too closely-spaced myotomies, and a myotomy too near the tenotomy. A 100 per cent. myotomy far back could only happen with gross carelessness, or failure to use the scissors under full direct vision. It would not be possible to repair a posterior myotomy of 100 per cent. should such a blunder be committed.

Haemorrhage and proptosis can occur, as in one of my early cases, though without permanent ill-effect, if the muscle-crushing is done hastily or feebly, or (more commonly) if the myotomies do not fall within the crushed areas.

Over-correction is very rare indeed, provided due regard is paid to the indications and contraindications as given above. It is easy, however, to overcorrect the squint if the smallest lateral rectus resection is performed at the same time as medial rectus recession-lengthening. I would advise against this combination of procedures, except when considerable experience has been obtained of the recession-lengthening method. It is safer to operate upon the lateral recti only at a second operation (not often required).

An overcorrection caused by adding lateral rectus resection to the medial rectus recession-lengthening is a curious one. I have not had any case severe enough to indicate re-operation, but the divergence varies abruptly during the excursion of the eyes from one side to the other.

In some cases there is a slight, but definite, limitation of adduction. In such cases the cosmetic result is good and there is either alternation or amblyopia, so the fault is of no consequence.
The tiresome "danger" of late divergence, so commonly seen after the orthodox medial rectus recession with lateral rectus advancement, is apparently not so much to be feared after the recession-lengthening operation. After 4 years, no significant change has taken place in any of my patients, though they are nearly all young yet, and may change as they grow.

RESULTS OF THE OPERATION

For at least a week after the operation some divergence is usual. A bruised appearance may develop if proper haemostasis has not been maintained at operation, but this is of little or no importance. The continuous sutures are pulled away 6 days after operation under cocaine anaesthesia, and the child can go home on the ninth day.

The results can be judged 2 to 3 weeks after operation. They are surprisingly consistent, and are reliable and predictable to a satisfactory degree, provided proper attention is given to all relevant factors when planning the operation. Most important of these factors are the true minimum and maximum angles of convergence.

The later results, up to 3 or 4 years, appear to be equally satisfactory. This operation does not, like the classical lengthening operations, lose its effect or part of its effect after a short time.

The most satisfactory feature of the operation is the constancy of the eyes in remaining straight after operation. A severe squint of very variable angle never obtains a really straight correction without occasional divergence, after the usual medial rectus recession with lateral rectus resection. In such cases the recession-lengthening operation gives notably superior results.

A detailed presentation of the records of the results of all cases treated by recession-lengthening is not being attempted at the present time, as this is an interim report only. A general impression only can be given, based upon a moderate number of cases so treated (66, not counting operations combining recession-lengthening with other procedures). These cases have constituted 12 per cent. of all squints submitted to operation.

It is to be stressed that recession-lengthening of only one medial rectus does not often give a satisfactory result, and that to combine this unilateral procedure with advancement or resection of the lateral rectus on the same side is absolutely contraindicated except very rarely indeed. In cases where bilateral medial rectus recession would appear slightly inadequate, the unilateral operation, with only one myotomy, can be combined with simple medial rectus recession on the other eye, and good results will then be obtained.

DISCUSSION

The recti are approximately 40 mm. long, and the medial rectus is practically all muscle. The lateral rectus is practically the same in size but has several millimetres of tendon which cannot contract. Therefore there is normally a slightly greater amount of muscular tissue in the medial than in the lateral rectus.
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In a considerable percentage of all convergent squints, possibly over 90 per cent., both concomitant and incomitant but especially the latter, I believe there is some greater or lesser degree of exaggeration of the normal slight dominance in strength of medial over lateral rectus. In many cases, at least, this supposition is well supported by findings at operation.

In more distinctly pathological cases, and in those with embryologically abnormal extrinsic ocular musculature, we see medial recti containing considerable proportions of tendon-like tissue, instead of the almost invisible elastic fibres of the normal muscles.

The operation under consideration is effective in two ways. Firstly, it gives a large recession effect without the limited convergence that would occur in a recession of 7 or 8 mm. Secondly, it ruins the function of about 15 mm. of muscular tissue, giving (when the operation is performed to the maximum) ultimately, medial recti with little more than 25 mm. of muscle in place of the previous 40 mm., the rest becoming, no doubt, inert tendon. That is to say, the myotomized muscle can be reduced to two-thirds, approximately, of its former dimensions as regards contractile tissue.

Assuming a medial rectus one-and-a-half times stronger than it should be, the operation of recession-lengthening could just about restore it to a normal state, in terms of quantity of muscle tissue. The recession and lengthening would offset a weakness of the lateral rectus (if present).

The classical lengthening operation is capable of giving a somewhat similar immediate effect, provided the marginal myotomies are bold enough, and are at least three in number. Two large transverse buttonholes and three pairs of marginal myotomies can also give a similarly large correction. The drawbacks are that the late results are not very predictable, probably because the proximity of the sclera to the wounded areas of the rectus muscle encourages the formation of scar-tissue in the myotomy-gaps, with gradual shortening and loss of the operative correction; also, the performance of numerous partial myotomies or button-holing can prove quite time-consuming, particularly if bleeding is not kept satisfactorily under control.

The recession-lengthening causes the myotomy-gaps to fall behind the scleral equator, completely out of contact with the globe. This may explain why subsequent shrinking rarely occurs in the lengthened muscles after this operation, with consequent lasting correction.

An operation designed to weaken over-strong, or relatively over-strong muscles, without any recession, has been described by Chavasse (1934). By the application of diathermy-current to the muscle a coagulation is induced which results in loss of muscle-tissue. Since this operation does not lend itself to the treatment of contractures, which often accompany muscular over-development, I have not attempted to employ it. With experience of its use, no doubt good results might be obtained in certain cases.

If, on the one hand, lasting correction is obtained by recession-lengthening as my cases appear to indicate, it remains to be seen whether, on the other hand, an actual over-correction tends to develop in adolescence. One is
only too familiar with the late divergence which sometimes spoils the initially good results of the more orthodox operations in cases where binocular vision is lacking. My cases, so far, tend to suggest that late divergence will not be common after the recession-lengthening operation. Late divergence seems to occur especially after external advancements performed on cases of squint with markedly variable angle, and such cases seem to be better treated by the new operation, doing little or nothing to the lateral recti.

With regard to clinical indications for the operation, the commonest will be found to be (c). It is surprising how many quite pronounced convergent squints do actually have a small minimum angle, often zero. It may not at first be obvious that such is so in any particular case. More than one attendance may be required in order to establish the true maximum and minimum when the angle is variable. It is as well to ask the parent if the squint ever disappears completely. It is seldom possible to obtain the desired information from the orthoptist’s report, though this does, of course, help considerably. It is useful to have the child look out of a window at a distant tree or other object when seeking the minimum angle. In very young patients one can spend much time in estimating the range of squint, but there can be no justification for trying the recession-lengthening operation upon cases which have not been properly watched and studied. It is a drastic operation which will give bad results if applied unsuitably or injudiciously; but when carefully performed upon well-chosen cases the results are often extremely gratifying, the eyes keeping quite straight at all times.

Consider a severe squint of variable degree, say 10 to 45°. Such a case can be nicely corrected by this operation, so that the eyes remain straight at all times. A bilateral medial rectus recession would barely half correct it; add a lateral rectus resection to one or both eyes and a better result will be obtained, but the eyes will not keep constantly straight; the result of this orthodox treatment will probably, at best, give a variable final angle of +10° to −10°, with an average of zero, and later a marked divergence may follow. If fusion can be developed or strengthened, the fusion may be cured and remain so, otherwise the result of surgery will be inferior to the results obtainable by the operation of recession-lengthening, in which a constant zero can be hoped for, even in the absence of binocular vision. As regards late divergence, time is yet required to settle this point, for the latter operation.

**Summary**

An operation is described for the correction of convergent squint in which the outstanding features are over-action and, often, contracture of the medial recti. The medial recti are recessed, lengthened, and weakened.

Indications for the operation are given, chief of which are congenital convergent squint and spasmodic or variable convergence of some severity.

An early appraisal of the results is attempted, these being considered to be very satisfactory within a 4-year period of observation.

**REFERENCE**