

SURGICAL PLAN FOR HORIZONTAL STRABISMUS

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Strabismus surgery can only rarely be considered to have a specific effect, as in an esodeviation with marked convergence excess at near fixation in which, for this reason, a recession of both medial recti muscles is performed; or in an exodeviation with a true divergence excess in which, therefore, a recession of both lateral recti is done; or when surgery is performed in one paretic horizontal muscle and its contralateral overacting yoke muscle.

In the majority of eso or exodeviations (either permanent, intermitent, or latent) there is a constant, unspecific, static deviation of about the same degree for distant and near fixation. The goal of surgery would be to move the visual axis in the opposite direction.

Therefore, in horizontal strabismus with about the same deviation for distance and near I think it is more logical to perform a recession-resection operation, which, without trying to alter the functions of convergence or divergence, only seeks to rotate the eyeballs to attain the desired paralelism of the visual axis.

INTERMITENT EXOTROPIA

Today we know that intermitent exotropia is not synonymous with divergences excess, as it was believed not so long ago. Thus, the bilateral recession of the lateral recti muscles is no longer considered the operation of choice for this defect. Routine symmetrical surgery is less frequently done now for intermitent exotropia, where many eye surgeons perform a monocular recession-resection operation. This asymmetrical surgery was encouraged by the works of Burian, that permitted to recognize the rare cases of true divergence excess from those with a pseudo divergence excess.

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In practice the results of the recession-resection operation have been more effective and permanent than those of bilateral recession of the lateral recti. This would demonstrate that intermittent exotropia is not generally the consequence of a dysfunction of convergence or divergence, but instead it should only be considered a basic, unspecific, positional deviation of the visual axis. A recession-resection operation eliminates this basic deviation by rotating mechanizally one or both eyes in the opposite direction.

In exodeviations I generally do the same number of millimeters of recession of the lateral rectus and of resection of the medial rectus, so as not to produce enopthalmos. This can be done because the lateral rectus muscle can be recessed 8 mm. without passing beyond the functional equator of the eyeball.

In the synoptophore I use the arc degrees scale, merely doubling the reading to convert it to prism diopters (approximate equivalence). I have noticed that in exodeviations the angle read thus by the synoptophore is generally about the same as the angle measured at distant fixation with the prism cover test, in contrast with what happens in exodeviations.

Table N° 1 shows the millimeters of recession-resection done for different angles of exodeviation, whether measured with the synotophore or prism cover.

TABLE N° 1

<i>Synoptophore, or Prism cover (distance)</i>	<i>Recession-resection</i>
— 20 ^Δ	5 & 5 mm.
— 30 ^Δ	6 & 6 mm.
— 40 ^Δ	7 & 7 mm.
— 50 ^Δ	8 & 8 mm.
— 60 ^Δ or more	3 or 4 muscles (in 1 or 2 sittings)

For 30 prism diopters, that is 15 arc degrees, a recession-resection of 6 and 6 mm. is done. For 50 prism diopters (that is 25 arc degrees) 8 and 8 mm. For prism diopters (30 arc degrees) or more, surgery will have to be divided between the two eyes.

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Bilateral recession of the lateral rectil will be done when there is a true divergence excess. That is when the deviation is definitely larger for distance than for near and remains so after occlusion of one eye for 1 hour.

Table N° 2, is used in the rare cases of true divergence excess.

TABLE N° 2

<i>Synoptophore, or Prism cover (distance)</i>	<i>Recession both L.R. ("true" divergence excess)</i>
— 20 ^Δ	5 mm.
— 25 ^Δ	6 mm.
— 30 ^Δ	7 mm.
— 40 ^Δ	8 mm.

If the exodeviation is definitely larger for near a resection of one medial rectus muscle, or both, will be done. The resection of 8 mm. of medial rectus corrects approximately 12 arc degrees of exo (synoptophore).

The same tables shown for intermittent exotropia are applied when the exodeviation is permanent or latent (exophoria); but in the latter I rely on measurements made with the Maddox rod and Maddox Wing test while neutralizing the deviation with prism of increasing strenght.

ESOTROPIA

In esodeviations the angle measured by the synoptophore is usually greater than the angle measured at distant fixation with the prism cover test. If 10 prism diopters are added to the latter it will usually result somewhat similar to the angle measured in the same patient with the synoptophore. Example: + 30 prism diopters (15 arc degrees) in the synoptophore and + 20 with the prism cover test for distance (20 + 10 = 30).

In esotropias the lack of paralelism of the eyes is not generally caused by a dynamic alteration of the function of convergence, but instead it ought to be considered as a basic, unspecific, positional deviation of the visual axis. This explains why esotropias are most commonly comitant and of the same degree for distance and for near. Therefore, in such cases I am also in favour of a recession-resection operation as the best way to rotate the eyes in the opposite direction to the basic deviation.

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In esodeviations the recession of the medial rectus cannot exceed 5 mm. so as not to surpass the functional equator of the eyeball. Table N° 3 is hence used in most esotropia operations.

TABLE N° 3

<i>Synoptophore</i>	<i>Prism cover (distance)</i>	<i>Recession-resection</i>
+ 10° (20 Δ)	+ 10 Δ to 15 Δ	4 & 6 mm.
+ 12½ (25 Δ)	+ 15 Δ	5 & 6 mm.
+ 15° (30 Δ)	+ 20 Δ	5 & 7 mm.
+ 20° (40 Δ)	+ 30 Δ	5 & 8 mm.
+ 25° (50 Δ)	+ 40 Δ	5 & 9 mm.; or
<i>Three muscle Op.</i>		
+ " "	"	4½ —7 — 4½ mm.
+ 30° (60 Δ)	+ 50 Δ	5— 7 —5 mm.
+ 35° (70 Δ)	+ 60 Δ	5— 8 —5 mm.
<i>Four muscle Op.</i>		
+ 40° (80 Δ)	5—6 mm. — 5—6 mm.
+ 50° (100 Δ)	5—7 mm. — 5—7 mm.
+ 60° (120 Δ)	5—8 mm. — 5—8 mm.

As shown in the third line, for 15 arc degrees (30 prism diopters) measured by the synoptophore, or 20 measured by the prism cover test for distance (20 + 10 = 30), a recession-resection of 5 and 7 mm. is done. For an esotropia of 25 arc degrees (50 prism diopters) in the synoptophore: recession-resection of 5 and 9 mm., or preferably surgery may be divided between the two eyes doing a 4½ and 7 mm. recession-resection in one eye and a 4½ mm. recession of the medial rectus muscle in the other eye. For 30 degrees (that is 60 prism diopters) in the synoptophore: three muscle operation 5-7 and 5 mm.). For 40 degrees (80 prism diopters): operation on the four horizontal muscles (5-6; 5-6).

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When the esotropia, measured with the prism cover test for distance, is over 45 prism diopters, (second column in Table N° 3), it is better to distribute surgery between the two eyes, attacking 3 or 4 muscles simultaneously. This drastic surgery, for large angle esotropia, may be the only way to totally correct the strabismus. Step by step surgery, on the other hand, may end up with a marked undercorrection after having operated the four horizontal rectus muscles. It is better to risk an overcorrection in these cases, since it is easier to reoperate a muscle undoing part of what was previously done than to reoperate it to increase an insufficient effect.

Bimedial recession. Practice has taught me that this operation (I usually do a 5 mm. recession), is less effective than a recession-resection operation.

Bimedial recession may be succesful in:

1. *V esotropia* measuring in the synoptophore up to 20 arc degrees, and diminishing to about 7 arc degrees (by cover test estimate), or less, in the extreme upward gaze. This even in emmetropic patients. Over these limits, either for the primary position (synoptophore) or for the upward gaze, it is better to perform a recession-resection or a three muscle operation.

In *V* esotropia the operation of bimedial recession will be combined with surgery on the inferior obliques if they are overactive.

2. In esotropia without a *V* phenomenon, but with a *high AC/C ratio*: higher deviation without glasses than would be expected according to the degree of hypermetropia; and/or greater deviation with glasses for near than for distance. In these patients a bimedial recession can only be effective in moderate deviations. When the "average" synoptophore measurement, with and without glasses, is over 15 arc degrees a bimedial recession will usually result in an undercorrection, either in the form of a residual small angle esotropia, or as a marked esophoria disclosed by the Maddox rod and Maddox Wing test. This has been, in fact, my experience with children that were operated over 2 or 3 years of age.

In esotropia with a high *AC/A* ratio and an "average" synoptophore measurement over 15 arc degrees a recession-resection operation is usually done.

Resection of both lateral recti muscles has given me good results in patients with *A* esotropia, if the esotropia almost disappeared in the extreme downward gaze. For an esotropia measuring 20 arc degrees in the synoptophore I perform a resection of 8 mm. of both lateral recti. This will be

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combined with the appropriate vertical muscle surgery when vertical defects are notorious.

One muscle operation: This is usually a supplementary operation, after a first has left a "small" residual esodeviation, which may be more marked in one lateroversion.

For example: recession of the other medial rectus muscle after a monocular recession-resection operation; or resection of one lateral rectus muscle after a bimedial recession or after a three muscle operation.

Surgery on an individual horizontal muscle can correct only 5 to 10 arc degrees of esodeviation (synoptophore measurement). For larger residual esodeviations, a two muscle operation will be done.

Surgery in amblyopic eyes. One may obtain a greater corrective effect in esotropic patients with amblyopia or persistent monocular suppression. In such cases before applying Table Nº 3 I subtract to the angle measured by the synoptophore 5 degrees for esotropias under 20 arc degrees, and subtract 10 degrees for esotropias over 20 arc degrees.

Amblyopia is the only condition that makes me modify the amount of surgery to be done. Operations were usually done over 2 years of age, that is when the angle of deviation could be accurately measured both pre-and postoperatively.

SUMMARY

The author shows us his technique for the correction of horizontal deviations, emphasizing the fact that in exodeviations the results are almost the same when they are measured with the synoptophore or the prism cover test, while in endodeviations 10 prism diopters more are obtained with the synoptophore than with the prism cover test. In exodeviations he usually performs the same number of resections of the medial rectus as retroinsertions of the lateral rectus; if they are intermittent he advises a monocular retroresection.

When there is an excess of divergence he recommends retroinsertion of both LR as well as retroinsertion of both MR in convergence excesses. In cases of exophorias he relies on measurements with the rod and Maddox wing. If the exodeviation is definitely larger for near, one or both MR is resected.

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In endodeviations the medial recti must not be reinserted more than 5 mm. so as not to go over the functional equator; when they are greater than 45 prism diopters 3 or 4 muscles are operated, and it is better to do so simultaneously. The author also presents correction tables which contain the deviation angle and the millimeters to be corrected.

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