An Overview for Concomitant Exotropia Management: Review Article

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ABSTRACT

Background: A common type of strabismus known as concomitant exotropia (XT) occurs when mismatched eyes deviate outward and the angle of deviation is the same regardless of which eye is fixed. Among ophthalmologists, there is no agreement on non-surgical treatment options for XT. For those who suffer from strabismus, surgery is an option for correcting their visual axis and restoring their ability to see in both eyes simultaneously. Instead, then severing the muscle, muscle plication involves folding the muscle around itself and stitching it in place, essentially shortening and tightening the muscle. Muscle plication has been found to reduce the risk of anterior segment ischemia by protecting the anterior ciliary arteries.

Objective: To hallmark the new guidelines options of concomitant exotropia management.

Conclusion: Muscle-tightening techniques such as excision, plication, advancement, and transposition have been documented in the literature. Technical simplicity, the ability to reverse it, shorter operating times, reduced surgical trauma, and the preservation of anterior ciliary arteries are only a few of the many advantages of plication.

Keywords: Concomitant Exotropia, Strabismus.

INTRODUCTION

As the visual axes of the eyes deviate outward, the condition known as exotropia occurs, which may manifest constantly or intermittently. It may be acquired or congenital, most often its etiology is unknown (primary forms of exotropia) but may be secondary to other underlying causes. Only 1% of people have it, with intermittent exotropia being the most common form (1). The risk of strabismus is increased in families with a history of strabismus, in women, astigmatism, myopia, and anisometropia, and in children with a mother who uses drugs or smokes during pregnancy (2).

Exotropia types:

A- Primary exotropia:
1- Intermittent exotropia: At distance fixation, non-constant exotropia is more prevalent than at close fixation. It accounts for nearly half of all children's exotropia (1).
2. Infantile exotropia:
It is very rare condition among the different types (3).

B-Secondary XT: Oculomotor palsy, Duane’s syndrome, craniofacial disorders, internuclear ophthalmoplegia (INO) (4).

C-consecutive XT: It occurs after surgery for esotropia or it even develops spontaneously in patients who had infantile exotropia (4).

D-Sensory Exotropia:
It is common for the eye to become exotropic in older children aged from two to 4 years and adults with a blindness or poor vision (4).

The aim of the review was to hallmark the new guidelines options of concomitant exotropia management.

Treatment of Concomitant Exotropia:

A-Non-surgical treatment:
Among ophthalmologists, there is no agreement on non-surgical treatment options for XT (5).

1-Correction of refractive error:
Corrective lenses should be provided in the case of a clinically severe refractive defect that causes impaired vision in one or both eyes. Exophoria compensation in myopia or absolute hypermetropia can be achieved with the help of refractive correction. Maintaining active accommodation necessitates prescribing full correction for myopia. Avoid correcting mild to moderate degrees of hyperopia to keep the accommodative convergence that controls the exodeviation in check (6).

2-Overcorrecting minus lens therapy (−2.00 to −4.00 D over the habitual distance prescription):
By promoting accommodative convergence, it can help minimize an exodeformation. Patients with a high accommodative-convergence/accommodation (AC/A) ratio benefit from this treatment. It can be utilised in a variety of ways, including enhancing myopia correction in myopes, reducing hyperopia correction in hyperopes, or prescribing corrective action of myopia in ametropes (7). However, when this treatment is withdrawn, the occasional exotropia returns to its prior level of control. If there is an increase in the frequency of deviations with lower power, the amount of the lens dipters is again raised. Two successive visits without an improvement in six months led to the termination of overminus therapy (8).

3-Treatment of amblyopia: Patching improves the sensory and motor fusion by an elimination of the suppression scotoma. Intermittent exotropia is rare, but if a patient's vision is impaired without an obvious cause (such as anisometropia or an ocular anatomical defect), it should prompt an ophthalmologist to look into the causes.
possibility of minor optic nerve or retina abnormalities (1).

4- Occlusion therapy (2 to 6 hours daily): By treating suppression and amblyopia, a phoria can be converted from an intermittent exotropia. A gradual reduction in the angle of deviation necessitates that the occlusion be maintained until no more change occurs. It is cancelled if there is no improvement after four months. However, it has a short-lived effect on extremely young children (3 to 10 years old). With equal preference for fixation, alternate occlusion can be applied (8).

5-Prism therapy: There are two types:-
A-Base-in prism (conventional prism): By enhancing sensory fusion when reading, it may be integrated into spectacles (9).
B-Base-out (inverse) prism: Convergence insufficiency exotropia can be treated by changing the picture in the eye's field of vision to where the eye is intended to be looking, which causes diplopia and stimulates fusion (10).

6-Orthoptic treatment: Fusional training activities and other techniques that use monocular targets or stereograms can be used with a major amblyoscope (11).

7-Botulinum toxin therapy: With an injection of just 2.5 international units (IU) into each of the bilateral recti, the angle drops from 30 prism diopters (PD) to a range of 6–10 in children, making it easier for them to see. Between 40% and 70% of trials are successful after six months. Injecting into the lateral rectus (LR), inferior oblique (IO), and superior rectus (SR) muscles can cause upper lid ptosis and subsequent esotropia (12).

B- Surgical treatment:
Indications for surgery: 1-Increasing frequency of strabismus (manifest 50% of the time or more). 2- Decreasing binocularity (e.g., stereopsis). 3- Decompensation from intermittent to constant exotropia. 4-Squinting and rubbing of the eyes, asthenopia, and accommodative spasms are becoming more common. 5-Friends, teachers, and even strangers have noticed the child's strabismus. If there is a clear and evident manifestation of a defect, it is considered cosmetic (4). Patients with angles of deviation less than 20 to 25 prism diopeters (PD) should not undergo surgery unless the fusion has deteriorated significantly; instead, they should be closely monitored (13).

Signs of progression:
The frequency with which exodeviation manifests itself has increased. Stereacuity is reduced. The absence of diplopia during the manifest phase indicates the development of suppression. The basic deviation grows in size, Convergence instability secondary to primary instability (13).

Time of surgical intervention:
The timing of surgical intervention for XT remains a matter of debate. The best opportunity for a complete cure is elimination of the exotropia angle prior to the development of a suppression scotoma and abnormal retinal correspondence (14).
In order to prevent overcorrection in visually immature newborns, Jampolsky (15) advocated delaying surgery until the child was 4 years old. Baker and Davies (16) found that patients who underwent surgery after the age of four had superior functional outcomes. While, Knapp (17) urged early surgical intervention. Johnson et al. (18) noted that good results with early intervention, others noted good results with intervention between 4 and 5 years (19).

Choice of operation:
Exotropia can be treated surgically in a variety of ways (4).

Lateral rectus recession:
For patients with real divergence excess, this is the chosen surgical procedure. The non-dominant eye may benefit from significant unilateral lateral rectus recessions in patients with mild aberrations up to 16 diopters. Muscle slack is created when the muscle insertion is moved closer to the origin. Recession of the rectus muscle has the largest impact on the muscle's functional area (20).

There are two types of muscle recession:
Fixed recession muscle is stitched to the cornea where it will be advanced. A suture is used to hang back the muscle from the scleral insertions. Suture can be easily threaded through the sclera's thick front sclera (20).

Recession-resection or recession-plication procedure:
Basic exodeviation is more likely to succeed with this method. Unilateral amblyopia frequently necessitates surgery on only one eye, thus the surgeon prefers to avoid surgery on the eye with adequate vision. In most cases, bilateral lateral rectus recessions and one or more medial rectus muscle excisions are necessary to treat large-angle exotropia with more than 2 prism diopters of exotropia. The basic or pseudo-divergence excess form of exotropia responds well to recession and resection, while the real divergence excess type responds better to bilateral LR recession (21).

Medial rectus resection:
The improved effect of bilateral medial rectus resections at close term on treating intermittent exotropia of the convergence insufficiency type (20).

Lateral incomitance:
A difference in the magnitude of lateral gaze deviation is seen. Some surgeons have proposed limiting the amount of recession in patients with preoperative lateral incomitance, as they are more prone to be overcorrected. The best treatment for concomitant strabismus is symmetrical bilateral surgery (20). The question whether unilateral or bilateral surgery yields better results has not been settled (4).
Table (1): Bilateral vs Unilateral Surgery in Exotropia

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
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<tbody>
<tr>
<td>Bilateral surgery (recession of both lateral recti or</td>
<td>-Does not create lid fissure anomalies on side-gaze.</td>
<td>-Bilateral surgery may be difficult to explain to patients.</td>
</tr>
<tr>
<td>resection/plication of both medial recti)</td>
<td>-Recessions do not sacrifice muscle tissue do not alter refractive error.</td>
<td>-Monocular surgery itself more readily to local anesthesia techniques.</td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Unilateral surgery (recession of one lateral rectus</td>
<td>-Preferred if one eye deeply amblyopic</td>
<td>-Resections/plications involve disposal of muscle tissue</td>
</tr>
<tr>
<td>and resection/plication of one medial rectus)</td>
<td>-Preferred if patient demands surgery on one eye</td>
<td>-Often leads to subtle lid tissue anomalies on side-gaze (wider in abduction</td>
</tr>
<tr>
<td></td>
<td>-Monocular surgery itself more easily to local anesthetic techniques.</td>
<td>than adduction).</td>
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Medial rectus muscle strengthening procedures:

1- Resection: (Figure 1)

Total removal of the part of the muscle and reattach it to the sclera. Because the anterior ciliary arteries are permanently disrupted, this may increase the risk of anterior segment ischemia in the patient. Strengthening or tightening the muscles of the rectus extraocular is the most common procedure.

![Figure 1](https://ejhm.journals.ekb.eg/)

2-Plication: (Figure 2)

Shortening and tightening of the muscle can be achieved by folding the muscle on itself and sewing it to the skin at its insertion point. Reducing the danger of anterior segment ischemia by manipulating the muscles of the anterior ciliary vessels has been found to allow simultaneous operations on numerous rectus muscles. The reversibility in the early postoperative phase is a major advantage. Plication was proposed as a surgical therapy for strabismus due to these reasons.

Doubts about the plication procedure's efficacy in comparison to muscle resection may be an obstacle to its increased acceptability. There was no statistically significant difference between the surgical outcomes of the two methods of treating exotropia/esotropia according to Chaudhuri and Demer's retrospective comparison of surgical outcomes.
Residual angle greater than 50 PD for exotropia greater than 60 PD \(^{(26)}\).

Strabismus surgery outcomes are impacted by a number of factors prior to the procedure. Variables such as the commencement of deviation, the age at surgery, the time gap between the onset of deviation and surgery, and the AC/A ratio were all examined by Kushner \(^{(27)}\) in their study.

Kushner \(^{(28)}\) reported evidence that response to strabismus surgery should correlate with axial length. Kushner \(^{(28)}\) reported significant negative correlation between axial length (AxL) and response for patients with esotropia and poor correlation for patients with exotropia. In both esotropia and exotropia groups, Ghali \(^{(29)}\) found a negative connection between AxL and the effect of recession. Longer AxL should have their recession increased. Mean dose response (MDR) =4.28 – (0.11×AxL) + (0.019×preoperative angle).

### CONCLUSION

Muscle-tightening techniques such as excision, plication, advancement, and transposition have been documented in the literature. Technical simplicity, the ability to reverse it, shorter operating times, reduced surgical trauma, and the preservation of anterior ciliary arteries are only a few of the many advantages of plication.

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### Conflict of interest:

Nil.

### REFERENCES