Risk Factors for Consecutive Exotropia

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It is an Exotropia Occurring After Surgical Correction of Esotropia

Clinical and surgical risk factors for consecutive exotropia

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Abstract

Introduction: Consecutive exotropia is one of the complications of exotropia surgery. Its prevalence is estimated at 4%–27%. The aim of this study was to identify the risk factors for consecutive exotropia in the aftermath of surgical treatment of exotropia.

Methods: Seventy-four patients examined in our strabismus consultation for a consecutive exotropia from January 2010 to June 2016 were retrospectively included. The age of onset of exotropia, the presence of amblyopia, the age of exotropia surgery and chosen procedure, the refractive errors, the anomalies of ocular motility, the age of onset of the consecutive exotropia and its angle of deviation were reported. Statistical analyses were performed with Student’s test and Fisher’s exact test.

Results: Exotropia occurred in 65% of cases before the age of 1 year, was associated with amblyopia in 51%, hyperopia in 55% or anisometropia in 31%. Surgery was performed before the age of 4 years for 55% of the patients and involved for 52% the both medial recti. The angle of deviation of consecutive exotropia was ≤20 prism diopters (PD) in 39%, 21–40 PD in 39% and ≥40 PD in 22%, related to amblyopia (p = 0.028), and to high hypermetropia (p = 0.05).

Discussion: Amblyopia and hyperopia were the most important risk factors of consecutive exotropia in our series. Early onset exotropia, strabismus abnormalities, anisometropia, oblique dysfunction, convergence insufficiency appeared but did not reach statistical significance.

Conclusion: Amblyopia is a major risk factor that should be taken into consideration during surgery of an exotropia.

Keywords
Strabismus, consecutive exotropia, strabismus surgery, risk factors, amblyopia

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Clinical and surgical risk factors

Early and late postoperative factors

Preoperative

- Age of onset of ET, and prematurity
- Neurodevelopmental state (CP)

Diagnosis

- Type of ET, and Variability of the angle.
- Timing of the surgery
- Associated vertical strabismus
- Hypermetropia, and error of refraction
- Amblyopia

Operative

- Amount of Medial rectus recession
- Asymmetrical surgery
- Type of suture used.
- Lost muscle

Post operative

- Post operative angle of deviation
- Postoperative glasses adjustment
- Limitation of adduction
- Amblyopia
- Stretched scar
- Slipped muscle
Preoperative

Patient’s Factors

- Age of onset of ET

Early onset ET ➔ High incidence of consecutive XT

- Low birth weight (premature)

➔ A very High incidence of consecutive XT

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Long-term surgical outcomes of infantile-onset exotropia in preterm patients compared with full-term patients

Kang H. Park, Tai Yool Oh

AIMS

To compare surgical outcomes and late outcomes of infantile-onset exotropia in preterm patients with those in full-term patients.

METHODS

From December 2005, 20 infants with exotropia aged 18 months or less were treated. Excluded were any infants who had undergone previous strabismus surgery, those with apparent primary position deviations exceeding 30 prism diopters, and those with an abnormal head circumference. The patients were divided into two groups: a preterm group (n = 9) and a full-term group (n = 11) based on gestational age. The primary surgical procedures were bilateral lateral rectus muscle recession, suture stabilization, multiple lateral rectus muscle recession, and double-arc recession. The primary success rate was defined as ≤10° of deviation in primary position, ≤10° of deviation in horizontal position, and ≤10° of deviation in vertical position.

RESULTS

The mean follow-up was 28.8 months (12–47 months). The primary success rate of the preterm group was 44.4% (4/9), and that of the full-term group was 54.5% (6/11). The mean age of surgery in the preterm group was 12.6 months (10–15 months), and that in the full-term group was 15.1 months (12–18 months). The mean postoperative deviation in primary position was 8° (5–15°) in the preterm group and 6° (1–20°) in the full-term group. The mean postoperative deviation in horizontal position was 4° (2–12°) in the preterm group and 3° (1–10°) in the full-term group. The mean postoperative deviation in vertical position was 2° (0–4°) in the preterm group and 1° (0–5°) in the full-term group.

CONCLUSIONS

This study suggests that exotropia in preterm patients may require a longer period of observation and more aggressive treatment than that in full-term patients.
- **Neurodevelopmental state (CP)**

**Surgical Outcomes of Medial Rectus Recession in Esotropia with Cerebral Palsy**

**Purpose:** To determine the outcome of a reduced amount of medial rectus (MR) muscle recession in esotropes with cerebral palsy (CP) and to compare the surgical response with that of normal controls.

**Participants:** Thirty esotropes with CP and 60 age-matched esotropes without CP who underwent unilateral or bilateral MR muscle recession.

**Methods:** The surgical amount of MR muscle recession was reduced by 1 mm per patient with CP.

**Main Outcome Measures:** Success rate, surgical response, cumulative probabilities of success, and factors affecting surgical responses evaluated by generalized linear mixed models.

**Conclusions:** Even with the reduced amount of recession, esotropes with CP showed a greater surgical response to MR muscle recession than did those without CP, and the incidence of late overcorrection was significantly higher compared with that of patients without CP.

**Figure 1.** Distribution of patients according the time of onset of consecutive exotropia: number of patients for each time frame.
Type of ET, and Variability of the angle.

Timing of the surgery

Associated vertical strabismus

Hypermetropia, anisometropia

Amblyopia

<table>
<thead>
<tr>
<th>Angle of esotropia</th>
<th>Surgery dosage</th>
<th>Number of patients</th>
<th>Consecutive XT (no. and percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12–25 PD</td>
<td>Rec MR 7–9 mm</td>
<td>28</td>
<td>7 (25)</td>
</tr>
<tr>
<td>26–35 PD</td>
<td>Rec MR 3 mm + Res LR 3 mm</td>
<td>13</td>
<td>1 (7)</td>
</tr>
<tr>
<td>36–45 PD</td>
<td>Rec MR 4 mm + Res LR 3 mm</td>
<td>15</td>
<td>2 (13)</td>
</tr>
<tr>
<td>46–55 PD</td>
<td>Rec MR 5 mm + Res LR 3 mm</td>
<td>11</td>
<td>3 (27)</td>
</tr>
<tr>
<td>56–80 PD</td>
<td>Rec MR 6 mm + Res LR 3 mm</td>
<td>18</td>
<td>5 (27)</td>
</tr>
</tbody>
</table>
Timing of the surgery

Table 1. Age at surgery and correlation with number of patients with consecutive exotropia (XT). Patients operated at 2 years of age showed a higher trend towards development of the consecutive XT (p = 0.08).

<table>
<thead>
<tr>
<th>Age at surgery (years)</th>
<th>Number of patients</th>
<th>Number of patients with consecutive XT (no. and percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16</td>
<td>6 (37)</td>
</tr>
<tr>
<td>3</td>
<td>14</td>
<td>3 (21)</td>
</tr>
<tr>
<td>4</td>
<td>13</td>
<td>3 (23)</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>4 (18)</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>1 (100)</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10-24</td>
<td>16</td>
<td>1 (6)</td>
</tr>
</tbody>
</table>

Associated vertical strabismus

- DVD
- IOOA
- Nystagmus

In our patients, as in other studies, a vertical deviation was often associated with the consecutive exotropia, suggesting that vertical factors might be related to the consecutive exotropia somehow. In almost half of our cohort, the patients experienced a consecutive vertical deviation along
Associated high Errors of refraction

High refractive errors may compromise the measurement of deviations and may cause miscalculation of the surgical amounts.

Hypermetropia

Diminished accommodative convergence during long-term follow-up.

Hypermetropia with amblyopia
Patients with hypermetropia have been reported to develop consecutive XT even without surgery. (Beneish et al. 1981; Swan 1983).

**Case report; Spontaneous consecutive exotropia**

**Refractive Error**

The range of mean spherical equivalent (sphere +1/2 cylinder) correction was +1.75 DS to +9.75 DS. The right eye had a mean (SD) of +5.14DS (±2.33) and the left eye had a mean of +5.75 DS (±1.85) (Fig. 1).

**DISCUSSION**

The early onset of esotropia, a high degree of hypermetropia, and a lack of BV were the most common factors found in association with the spontaneous development of consecutive exotropia.

**Amblyopia**

Poor fusion, poor stereopsis, poor binocular function

**Types of Amblyopia**

- Anisomericomp
- Strabismic
- Deprivalional form
- Mixed form

- Anisohypermetropia
- Esotropic (micotropia)
- Unilateral cataract
Preoperative Patient
- Age of onset of ET, and prematurity
- Neurodevelopmental state (CP)

Diagnosis
- Type of ET, and Variability of the angle.
- Timing of the surgery
- Associated vertical strabismus
- Hypermetropia, and error of refraction
- Amblyopia

Operative
- Amount of Medial rectus recession
- Asymmetrical surgery
- Type of suture used.
- Multiple sutures.
- Lost muscle.

Post operative
- Postoperative angle of deviation.
- Postoperative glasses adjustment.
- Limitation of adduction.
- Amblyopia.
Operative

- Amount of Medial rectus recession
- Asymmetrical surgery
- Type of suture used
- Multiple surgeries
- Lost muscle

### A symmetrical surgery

### Type of suture used

- Multiple surgeries to correct esotropia
Preoperative

- Age of onset of ET, and prematurity
- Neurodevelopmental state (CP)

Diagnosis

- Type of ET, and Variability of the angle.
- Timing of the surgery
- Associated vertical strabismus
- Hypermetropia, and error of refraction
- Amblyopia

Operative

- Amount of Medial rectus recession
- Asymmetrical surgery
- Type of suture used.
- Lost muscle

Post operative

- Post operative angle of deviation.
- Postoperative glasses adjustment.
- Limitation of adduction
- Amblyopia.
Consecutive exotropia is an exotropia in a previously esotropic patient, most often developing after surgical intervention for esotropia. In surgical planning for consecutive exotropia, the typical immediate postoperative target angle is a small esodeviation because most patients are expected to experience postoperative exodrift. For some patients, exodrift occurs in excess of the anticipated magnitude, leading to recurrence of the esodeviation, whereas for others an unexpected...
Consecutive exotropia

- Limitation of adduction
**Medial rectus** retracts posteriorly within its capsule caused by **inadequate suturing.**

**Present shortly after** strabismus surgery.
Postoperative glasses adjustment

**Partially accommodative esotropia**

- CXT occurs following surgery.
- **Reduce** the glasses by +2.0 to +3.0 D if high hyperopia.
- **Discontinue** the glasses if hyperopia ≤ +3 D.
- Start **Orthoptic and amblyopia** treatment.
Summary

- We Must aware of the risk factors for consecutive exotropia.

- Consecutive exotropia must be early detected and treated to avoid its progression.

- Amblyopia should be treated before and after surgery.

Small Stable Residual Esotropia is much better than progressive consecutive exotropia

Prof. Ibrahim El-Adawe
Thank you!

Marni Katzen