Risk Factors for Consecutive Exotropia

By

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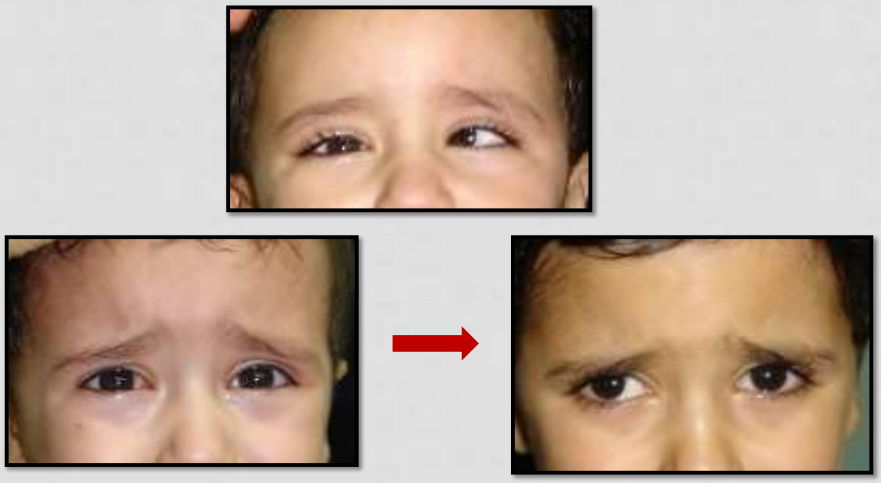
It is an Exotropia Occurring After Surgical Correction of Esotropia



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Clinical and surgical risk factors for consecutive exotropia

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Abstract

Introduction: Consecutive exotropia is one of the complications of esotropia 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 esotropia.

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 esotropia, the presence of amblyopia, the age of esotropia 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: Esotropia 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 6 years for 55% of the patients and involved for 52% the both medial recti. The angle of deviation of consecutive exotropia was ≤20 prism dioptres (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 esotropia, stereopsis 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 esotropia.

Keywords

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

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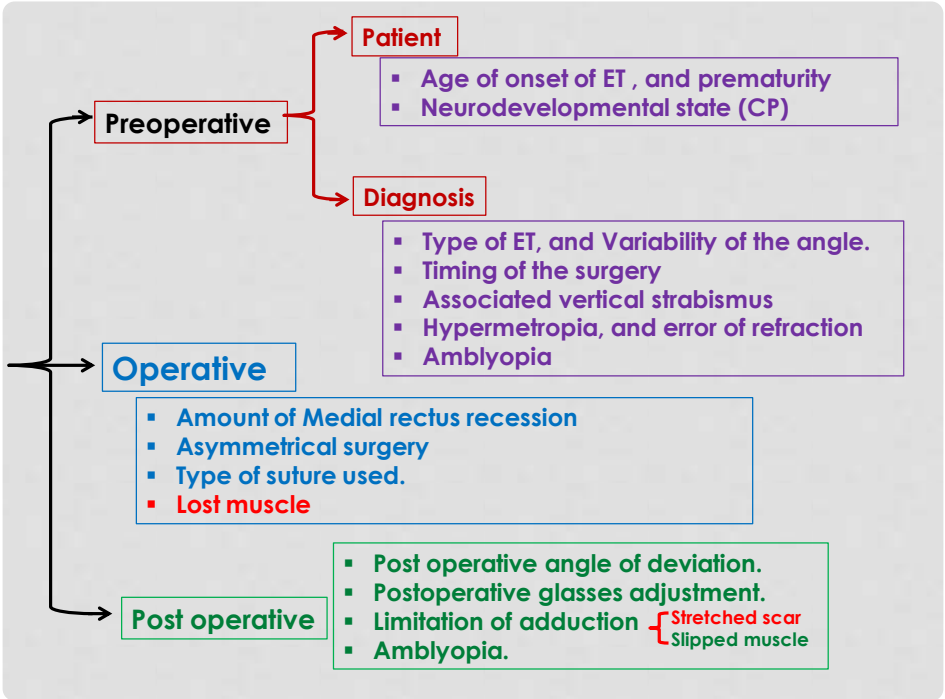
Clinical and surgical risk factors

Early and late postoperative factors



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



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

Kyung-Ah Park, Sei Yeul Oh

- **Neurodevelopmental state (CP)**

Surgical Outcomes of Medial Rectus Recession in Esotropia with Cerebral Palsy

Dae Jung Min, MD,* Hee Kyung Yang, MD,* Jeong-Min Hwang, MD

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.
Design: Retrospective cohort study.
Participants: Thirty esotropes with CP and 60 age-matched esotropes without CP who underwent a unilateral or bilateral MR muscle recession.
Methods: The surgical amount of MR muscle recession was reduced by 1 mm per muscle in patients with CP.
Main Outcome Measures: Success rates, surgical response, cumulative probabilities of success, and factors affecting surgical responses evaluated by generalized linear mixed models.
Results: In patients with CP, the initial success rate was higher ($P = 0.037$) and the rate of undercorrection was lower ($P = 0.037$) compared with patients without CP. At the final visit, success rates were not significantly different between both groups. However, the rate of overcorrection was higher ($P = 0.003$) compared with patients without CP. The rate of overcorrection per person-year during follow-up was 11% in patients with CP and 2% in patients without CP. Patients with CP showed a greater surgical response than did those without CP, at about 1.3 prism diopters per millimeter of MR muscle recession ($P < 0.001$).
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.


Acta Ophthalmologica

Consecutive exotropia after surgical treatment of childhood esotropia: a 40-year follow-up study

Diagnosis

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

▪ Type of ET, and Variability of the angle

Angle of esotropia	Surgery dosage	Number of patients	Consecutive XT (no. and percentage)
12–25 PD	Rec MR 7–9 mm	28	7 (25)
26–35 PD	Rec MR 3 mm + Res LR 3 mm	13	1 (7)
36–45 PD	Rec MR 4 mm + Res LR 3 mm	15	2 (13)
46–55 PD	Rec MR 5 mm + Res LR 3 mm	11	3 (27)
56–80 PD	Rec MR 6 mm + Res LR 3 mm	18	5 (27)

▪ 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 ($p = 0.08$).

Age at surgery (years)	Number of patients	Number of patients with consecutive XT (no. and percentage)
2	16	6 (37)
3	14	3 (21)
4	13	3 (23)
5	22	4 (18)
6	3	0
7	0	0
8	1	1 (100)
9	0	0
10–24	16	1 (6)

▪ Associated vertical strabismus

- DVD
- IOOA
- Nystagmus

In our patients, as in other studies,[11,13] 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

Table 1. Age of onset of esotropia, refractive errors and prevalence of amblyopia in the patients of the cohort.

Age of onset of esotropia	Number of subjects, out of 43	Percentage
Infantile	15	35%
3 months to 1 year	13	30%
>1 year	15	35%
Refractive errors	Number of subjects, out of 51	Percentage
Hyperopia >+4.00 D	28	55%
Anisometropia	16	31%
Amblyopia	Number of subjects, out of 69	Percentage
Present	35	51%
Relative amblyopia (≥2 lines of difference between eyes)	17	25%
Deep amblyopia (visual acuity <20/32 of the weaker eye)	18	26%

- 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

Spontaneous Consecutive Exotropia in Childhood

Refractive Error

The range of mean spherical equivalent (sphere +½ cylinder) correction was +1.75 DS to +9.75 DS. The right eye had a mean (SD) of +5.14DS (±2.55) and the left eye had a mean of +5.75 DS (±1.85) (Fig. 1).

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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.

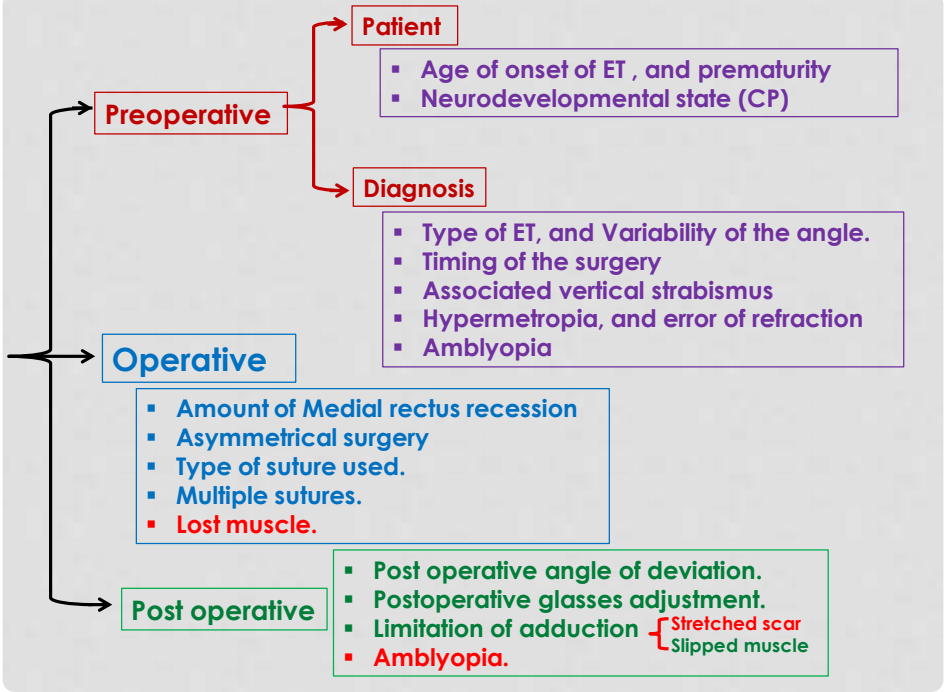
▪Amblyopia

Poor fusion ,poor stereopsis, poor binocular function

Types of Amblyopia

- **Anisomeropic** ⟹ **Anisohypermetropia**
- **Strabismic** ⟹ **Esotropic (micotropia)**
- **Deprivational form** ⟹ **Unilateral cataract**
- **Mixed form**

Visual acuity (VA) of study population in 2001–2003	Total number	Number of patients with consecutive exotropia (%)
Deep amblyopia VA = FC – 0.3	4	1 (25)
Moderate vision VA = 0.4–0.8	25	6 (24)
Good vision VA = 0.9–1.0	56	11 (20)



Operative

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

Amount of Medial rectus recession

Table 2. Amount of surgery and correlation with number of patients with consecutive exotropia (XT) (p = 0.649; not significant). Rec = Recession; Res = Resection; MR = medial rectus; LR = lateral rectus; PD = prism dioptre.

Angle of esotropia	Surgery dosage	Number of patients	Consecutive XT (no. and percentage)
12–25 PD	Rec MR 7–9 mm	28	7 (25)
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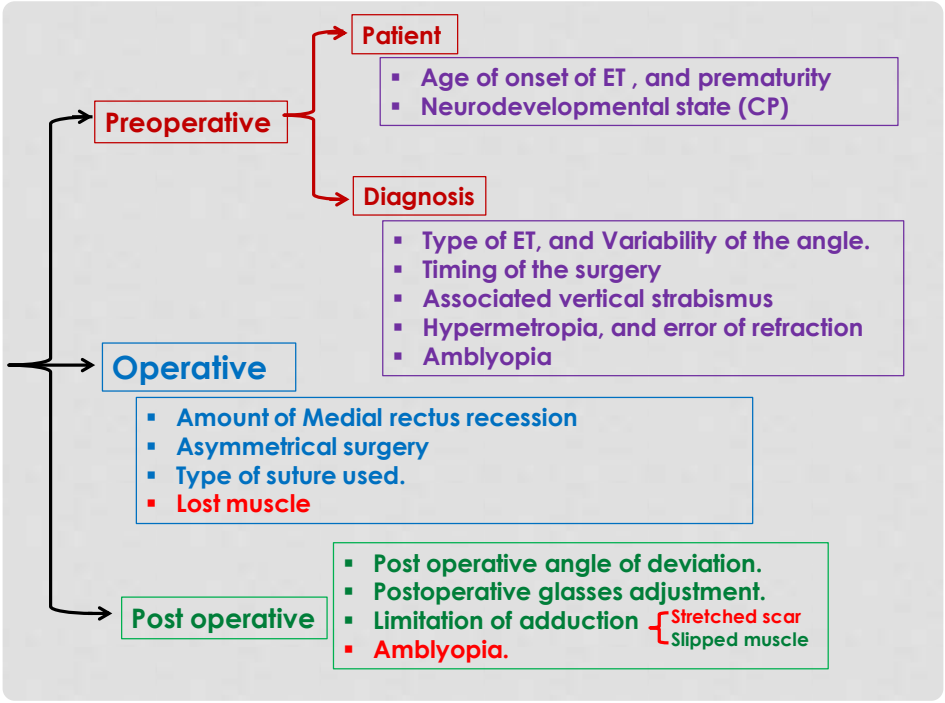
A symmetrical surgery

Type of suture used

Multiple surgeries to correct esotropia



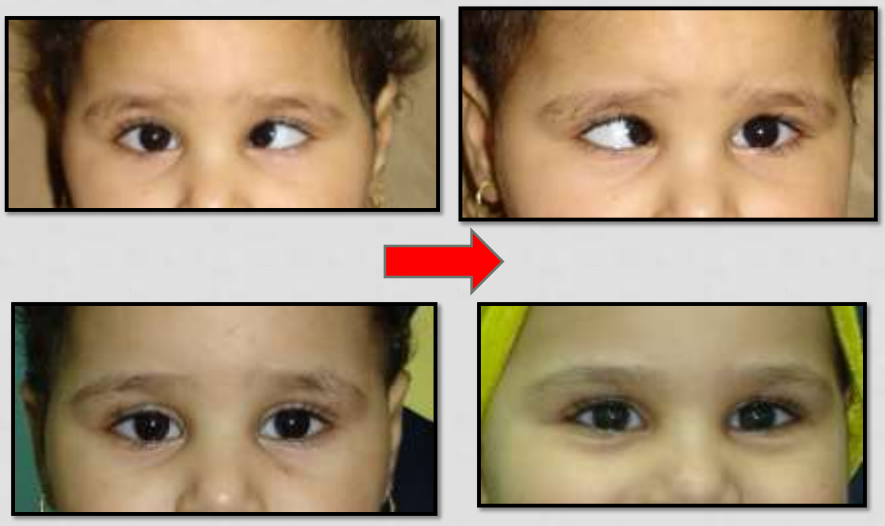
Post operative

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

▪ Post operative angle of deviation

Factors associated with atypical postoperative drift following surgery for consecutive exotropia

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 exodeviation, whereas for others an unexpected



Slight under correction (10pd)

Consecutive exotropia

- **Limitation of adduction**

TABLE 3
Possible Common Risk Factors for the Development of Consecutive Exotropia

Risk Factor	Exotropia (n = 47)	No Exotropia (n = 54)	P
Refractive error (D)			.103[a]
Mean ± SD	2.53 ± 2.16	1.92 ± 1.41	
Range	0 to 9.00	0.25 to 6.25	
Amblyopia	31 (66%)	12 (22.2%)	.004[b]
Anisometropia	20 (42.6%)	5 (9.3%)	.003[b]
Inferior oblique overaction	13 (27.7%)	12 (22.2%)	.841[b]
Asymetric surgery	29 (61.7%)	5 (9.3%)	.000[b]
Limitation of adduction	14 (29.8%)		.000[b]
Fusion	5 (10.6%)	7 (13%)	.564[b]
Stereopsis	2 (4.3%)	3 (5.6%)	.650[b]

D = diopter; SD = standard deviation
[a]Mann–Whitney *U* test.
[b]Chi-square test.

Limitation of adduction

- **Stretched scar**
- **Lost muscle**
- **Slipped muscle**

Slipped muscle

- **Medial rectus retracts posteriorly within it's capsule caused by inadequate suturing.**
- **Present shortly after strabismus surgery**

See through sign

▪ 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 progresive consecutive exotropia**

Prof. Ibrahim El-Adawe


Thank you!
Manal Kasem