

---

## ORIGINAL PAPER

---

# SURGERY FOR CONSECUTIVE EXOTROPIA AFTER BIMEDIAL RECTUS RECESSION: A CASE SERIES

VALENTIN DINU<sup>1,2</sup>, RAMONA BARAC<sup>1,2</sup>, DOINA DINU<sup>1</sup>

<sup>1</sup>Clinical Emergency Eye Hospital, Bucharest, Romania

<sup>2</sup>"Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

### SUMMARY

**Background:** Consecutive exotropia (or secondary exotropia) is a complication that can arise at any stage in the management of esotropia, be it medical or surgical. It is notoriously difficult to treat due to its tendency to relapse, making extensive surgery necessary in some cases.

**Case series:** We present a series of 7 cases all operated by the same surgical team for convergent strabismus, that were later, at varying intervals, reoperated for consecutive exotropia. All cases were followed-up for a minimum of 4 years after the second surgery. Repeat surgery for residual consecutive exotropia was not needed in any case.

**Results:** Although most patients had risk factors impeding normal binocular vision (amblyopia, a long history of abnormal binocular function, vertical deviations), the final result from a functional standpoint, in most cases, was at least simultaneous perception at near fixation. Anatomically, all cases were within 10 XT and 10 ET for the remainder of the follow-up, which was aesthetically acceptable.

**Conclusions:** Consecutive exotropia may take years to develop and is usually associated with amblyopia and low binocular vision potential. Large initial medial rectus recessions (greater than 5 mm) should be avoided as they can limit the muscle's function. Amblyopia should be, at least partially, corrected prior to surgery and continued afterwards if necessary. Near binocular vision is more common in strabismus patients than distance binocular vision (1) and some authors argue that it is actually more useful in every day activities (2).

**Abbreviations:** BCVA – best corrected visual acuity, OD – oculus dexter, OS – oculus sinister, OU – oculus uterque, ET – esotropia, XT – exotropia, PD – prism diopter

**Key words:** Medial rectus recession, medial rectus advancement, secondary exotropia, consecutive exotropia, strabismus, binocular vision, amblyopia

### RÉSUMÉ

*La chirurgie pour l'exotropie consécutive après la récession du droit médial: une série de cas*

**Contexte:** L'exotropie consécutive (ou exotropie secondaire) est une complication qui peut survenir à tout moment dans la gestion des esotropia, que ce soit médical ou chirurgical. Il est notoirement difficile à traiter en raison de sa tendance à la rechute, ce qui rend la chirurgie extensive nécessaire dans certains cas.

**Série de cas:** Nous présentons une série de 7 cas, tous opérés par la même équipe chirurgicale pour strabisme convergent, qui ont été plus tard, à des intervalles variables, réopérés pour exotropie consécutive. Tous les cas ont été suivis pendant un minimum de 4 ans après la deuxième intervention chirurgicale. Dans tous les cas, la chirurgie répétée pour exotropie consécutive récidivante n'a pas été nécessaire.

**Résultats:** Bien que la plupart des patients présentaient des facteurs de risque qui entravent la vision binoculaire normale (amblyopie, une longue histoire de la fonction binoculaire anormale, déviations verticales), le résultat final du point de vue fonctionnel, dans la plupart des cas, était au moins la perception simultanée du point de fixation. Anatomiquement, tous les cas étaient dans les 10 XT et 10 ET pour le reste de suivi, qui a été esthétiquement acceptable.

**Conclusions:** L'exotropie consécutive peut prendre des années pour développer et est généralement associée à l'amblyopie et le faible potentiel de vision binoculaire. Les récessions initiales du droit médial (supérieure à 5 mm) doivent être évitées car ils peuvent limiter la fonction du muscle. L'amblyopie doit être, au moins partiellement, corrigée avant la chirurgie et continuée par la suite si nécessaire. La vision binoculaire de près est plus fréquente chez les patients atteints de strabisme que la vision binoculaire de loin (1) et certains auteurs font valoir qu'il est effectivement plus utile dans les activités quotidiennes (2).

**Mots clés:** La récession du droit médial, l'avancement du droit médial, exotropie secondaire, exotropie consécutive, le strabisme, la vision binoculaire, amblyopie

---

Correspondence address:

Valentin Dinu, MD

Clinical Emergency Eye Hospital, Bucharest, Romania

e-mail: dinu\_valentin2000@yahoo.com

## INTRODUCTION

Consecutive exotropia is a complication that arises in the management of convergent strabismus which can occur spontaneously or iatrogenically after surgery. Early onset of exotropia following bilateral medial rectus recession is usually due to overcorrection of the initial deviation, while late onset exotropia is associated with low vision (sensory exotropia), high hyperopia (3,4) and failure to achieve binocular vision. Binocular vision, as a measure of success in strabismus surgery and management, requires good eye alignment in order to fully develop, as well as provides better alignment once it has been achieved. Our goal as clinicians should be to obtain the highest degree of binocular single vision possible for the patient.

Consecutive exotropia resulting from overcorrection of the initial esodeviation may be due to excessive resection of the lateral rectus muscle or to excessive recession of the medial rectus muscle. If the lateral rectus has been excessively resected, it will limit both passive and active adduction, whereas if the medial rectus has been excessively recessed, it will only limit active adduction (4). If there is no restriction of adduction, it is best to wait for spontaneous improvement, while reducing the hyperopic spectacle correction and/or prescribing prism correction.

The surgical procedure of choice for consecutive exotropia is advancement of the previously recessed medial rectus muscle to its original insertion, with or without resection of the same muscle. Should this procedure not be enough, a lateral rectus recession may be added (5).

## MATERIAL AND METHODS

### Case 1

A 9-year-old boy presented to our clinic for exotropia following surgery for concomitant esotropia at the age of 7. His refraction at the time of surgery was +2 +0.5 X 90° OD and +2.75 +2.5 X 90° OS. Due to cylindrical ametropia, his left eye had been deeply amblyopic (BCVA 20/20 OD, 1/20 OS). His preoperative angle measured 35 ET and an inferior oblique overaction was noted. Patching had been prescribed and VA was partially recovered prior to surgery (BCVA 10/20 OS).

The patient underwent bilateral medial rectus recession 10 mm from the limbus. Postoperatively, the patient was orthotropic, but had no binocular vision. One year after the surgery, the patient returned for his follow-up without having worn his glasses and having stopped patching the amblyopic eye. His VA deteriorated because of the lack of consistent patching and was now 5/20 OS. His objective angle was 20 XT OS with an inferior oblique overaction and he was scheduled for repeat surgery.

The patient underwent medial rectus resection and advancement to the original insertion and also inferior rectus recession 3.5 mm from the insertion in his left eye. Postoperatively, the patient had a residual angle of 7PD and no vertical deviation. The patient never achieved binocular

vision due to suppression in his left eye because his VA never improved past 5/20 OS.

### Case 2

A 7-year-old girl presented to our clinic for consecutive exotropia following surgery for esotropia at the age of 4. Her refraction at the time of surgery was +2.25 +1.5 X 90° OD and +2 +2.5 X 90° OS. Due to cylindrical ametropia, her left eye had been amblyopic (BCVA 20/20 OD, 6/20 OS). Her preoperative angle measured 55 ET and an inferior oblique overaction was noted. Patching had been prescribed prior to surgery and VA had partially improved to 10/20 OS.

The patient underwent bilateral medial rectus recession 10 mm from the limbus. Postoperatively, her objective angle was 10 XT with no binocular vision. One year after surgery, on her follow-up she was 10 XT with no binocular vision and having stopped patching her left eye. BCVA was 20/20 OD and 10/20 OS. On her second follow-up, 3 years after surgery, BCVA was 20/20 OD and 14/20 OS, her objective angle was 20 XT and she was scheduled for repeat surgery (fig. 1).

The patient underwent a 4.5 mm medial rectus resection and advancement to the original insertion in her left eye only. Postoperatively, the patient was orthotropic and had developed near binocular vision, measuring 5PD on the Maddox wing (fig. 2).

### Case 3

A 6-year-old girl presented to our clinic for exotropia following surgery for convergent strabismus when she was 5 years old. Her refraction then was +1.5 OU and her objective angle was 35 ET. She was amblyopic in her left eye with BCVA 10/20 OD and 2/20 OS, but VA had been completely improved prior to surgery.

The patient underwent bilateral medial rectus recession 10.5 mm from the limbus. Postoperatively, her objective angle was 20 XT with no binocular vision. On her follow-up, one year after surgery, nothing had changed and surgery for the consecutive exotropia was planned.

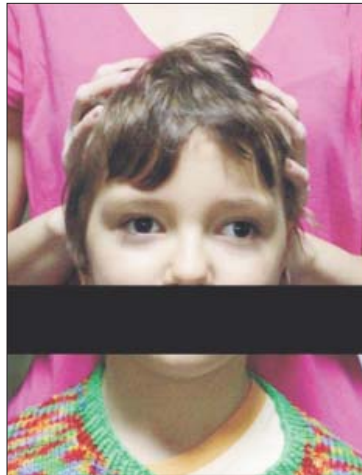
The patient underwent medial rectus resection and advancement to the original insertion in her left eye. Following surgery, she was 10 XT and had developed some degree of binocularity with simultaneous perception at near fixation on the Maddox wing.

On her last follow-up, at 27 years of age, her right eye was found to have become myopic of -1.5, while her left eye remained hyperopic of +1. Her rudimentary binocularity was preserved.

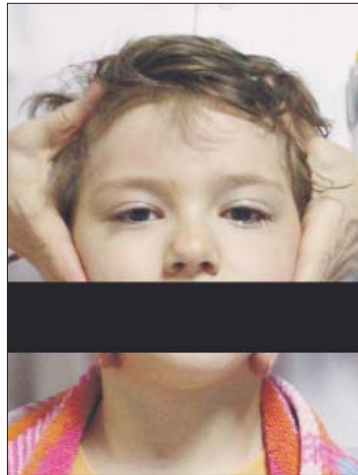
### Case 4

A 7-year-old boy presented to our clinic for consecutive exotropia following surgery for convergent strabismus at the age of 4. His refraction at the time of surgery was +4.75 +1.5 X 110° OD and +4.25 +1.75 X 70° and his objective angle was 35 ET with glasses. BCVA was 4/20 OD and 10/20 OS with no binocular vision and nystagmus.

He underwent bilateral medial rectus recession 9.5 mm from the limbus and was 20 PD exotropic immediately



*Figure 1 - Pre-operative photo in primary position. Note left eye exotropia. Personal photograph by author*



*Figure 2 - Post-operative photo in primary position. Orthotropia. Personal photograph by author*

after surgery. On his next follow-up, a year later, VA in his right eye hadn't improved as he hadn't continued patching and still had 20 XT. After several follow-ups, he is scheduled for reintervention.

The patient underwent a 4mm medial rectus resection and advancement to the original insertion in his right eye. After the surgery, he was orthotropic but still didn't achieve any degree of binocular vision since vision in his right eye never improved.

#### *Case 5*

A 7-year-old boy presented to our clinic for exotropia following surgery for convergent strabismus when he was 4 years old. His refraction at the time of surgery was +3 OU and his objective angle 55 ET. He had not been amblyopic in either eye.

The patient underwent bilateral medial rectus recession 10.5 mm from the limbus and was orthotropic immediately after surgery with no binocular vision. On his follow-up, 3 years later, he is found to be exotropic of 35 PD and is scheduled for surgery.

A bilateral medial rectus resection and advancement to the original insertion was performed. Following surgery, the patient is orthotropic with no binocular vision at distance fixation and achieving an unstable one at near fixation with a small exotropia (4-8 XT on the Maddox wing).

#### *Case 6*

An 11-year-old girl presented to our clinic for consecutive exotropia following surgery for convergent strabismus at the age of 4. Her refraction at the time was +3.5 +2.5 X 95° OD and +4.25 +2.75 X 75° and her objective angle was 55 XT. Her right eye had been mildly amblyopic, but the condition had been resolved through patching.

She underwent bilateral medial rectus recession 10 mm

from the limbus and was 10 PT exotropic following surgery with no binocularity present. Her convex correction was removed from her glasses leaving only the cylinder lens. On her first follow-up, cover testing revealed 10 PD of esophoria and the Maddox wing revealed 5 ET. On her next follow-up, 2 years later, her left eye was 5 XT and on her next visit, 3 years after, her left eye was 20-30 PD exotropic at distance fixation and 6 XT at near.

A 4mm medial rectus resection and advancement to the original insertion in her left eye was performed. Postoperatively, the patient was 5 PD XT with suppression at distance fixation and simultaneous perception at near with prism correction. On her last visit, at 14 years of age, she is orthotropic with 5 XT on cover testing, no binocularity at distance and 3 ET on the Maddox wing.

#### *Case 7*

A 14-year-old girl presented to our clinic for exotropia following surgery for convergent strabismus when he was 6 years old. Her refraction at the time was +2 OU and her preoperative objective angle was 25 ET. No amblyopia was present.

She underwent bilateral medial rectus recession 10mm from the limbus and was 7 PT esotropic following surgery with no binocularity present. On her subsequent follow-ups, she developed exotropia that augmented with time up to 30 XT 6 years after surgery.

A 5mm bilateral lateral rectus recession coupled with a bimedial rectus advancement to the original insertion was performed. Postoperatively, she was orthotropic and had achieved binocular vision at near fixation at 7 ET on the Maddox wing.

## **DISCUSSION**

This case series emphasizes the importance of the long-

term follow-up for strabismus and tries to underline some risk factors for the final outcome of the patients. The success of failure of a given surgical intervention cannot be judged on a short term basis, since consecutive exotropia can develop many years following the initial surgery for esotropia (6). In our cases, which were all operated by the same surgical team, consecutive exotropia either occurred early (within the first year) after surgery or late, after 7-8 years of apparent binocular control.

All our cases had been amblyopic, hyperopic or both and the ones who fared worst were the ones who either stopped patching (7) or stopped wearing their glasses (cases 1 and 4). Amblyopia correction is of paramount importance in respect to achieving any degree of binocular vision, not only through recovery of visual acuity, but also through overcoming the suppression scotoma. Patients should also have the smallest hyperopic correction that allows for good vision and good alignment. Care should be taken when operating partially accommodative esotropia (case 4) as the surgical dosage can easily be overestimated. Many authors (3,4,8) advocate for conservatism regarding early surgical treatment for these cases.

None of our cases had a bimedial rectus recession greater than 10.5 mm from the limbus which is a known issue and risk factor for consecutive exotropia (5,9). These large recessions can induce an underaction of the medial rectus muscle that progresses over time.

The type of repeat surgery performed in all our cases was advancement of the previously recessed medial rectus muscle to its original insertion coupled most of the times with a resection of the same muscle. Postoperatively, the patients that could achieve binocular vision, had done so at near fixation only, possibly related to the fact that, at least in theory, medial rectus advancement allowed for better eye alignment at near, while lateral rectus recession would allow for better alignment at distance fixation.

None of our cases had reported slippage of the medial rectus involved in the repeat surgery, although this issue is

subject to a lot of articles in the scientific community (10–12). Our technique for bimedial rectus recession involves placing two 6-0 sutures through the muscle 1mm posteriorly to its insertion, while passing the needles deeply through the sclera. This is done to avoid slippage of the muscle within its capsule for the former and to avoid early disinsertion for the latter (5).

### *Conflict of interest*

There is no conflict of interest.

### **REFERENCES**

1. Rutstein, R. P. & Corliss, D. A. BVAT distance vs. near stereopsis screening of strabismus, strabismic amblyopia and refractive amblyopia; a prospective study of 68 patients. *Binocul. Vis. Strabismus Q.*15, 229–36 (2000).
2. Fielder, A. R. & Moseley, M. J. Does stereopsis matter in humans? *Eye*10, 233–238 (1996).
3. Noorden, G. K. Von. *Binocular Vision and Ocular Motility: Theory and Management of Strabismus.* (2002).
4. Noorden, G. K. Von & Helveston, E. M. *Strabismus: a decision making approach.* (1994).
5. Helveston, E. M. *Surgical Management of Strabismus.* Wayenborgh Publishing (2005). doi:10.3368/aoj.56.1.202
6. Folk, E. R., Miller, M. T. & Chapman, L. Consecutive exotropia following surgery. *Br. J. Ophthalmol.*67, 546–8 (1983).
7. Han, S. Y., Han, J., Rhiu, S., Lee, J. B. & Han, S.-H. Risk factors for consecutive exotropia after esotropia surgery. *Jpn. J. Ophthalmol.*60, 333–340 (2016).
8. Stangler-Zuschrott, E. *Strabismus convergens bei hohergradiger Hypermetropie.* *Klin Monatsbl Augenheilkd* 469 (1975).
9. Burian, H. M., Berke, R. N. & Landolt, E. *The Principles of Surgery on the Extraocular Muscles.* *Am. J. Ophthalmol.*33, 577–582 (1950).
10. Sawada, M., Hikoya, A., Negishi, T., Hotta, Y. & Sato, M. Characteristics and surgical outcomes of consecutive exotropia of different etiologies. *Jpn. J. Ophthalmol.*59, 335–340 (2015).
11. Leon, B. G. & Demer, J. L. Consecutive exotropia: why does it happen, and can medial rectus advancement correct it? *J. Am. Assoc. Pediatr. Ophthalmol. Strabismus*18, 554–558 (2014).
12. Plager, D. A. & Parks, M. M. Recognition and Repair of the 'Lost' Rectus Muscle. *Ophthalmology*97, 131–137 (1990).