Chulalongkorn Medical Journal

Volume 41
Issue 4 *April 1997*

Article 3

4-1-1997

Large bilateral medial rectus recessionsin large angle congenital esotropia

S. Yaisawang

นิพนธ์ต้นฉบับ

Large bilateral medial rectus recessions in large angle congenital esotropia.

Sudarat Yaisawang*

Yaisawang S. Large bilateral medial rectus recessions in large angle congenital esotropia. Chula Med J 1997 Apr;41(4): 253-63

Objective : *To evaluate the results of large bilateral medial rectus recessions in a group of patients with large angle congenital esotropia.*

Setting : *Strabismus Clinic, Department of Ophthalmology, Faculty of Medicine, Chulalongkorn University.*

Design : *Prospective clinical study*

Patients : *Forty-two patients with congenital esotropia who had a deviation of 50-90 prism diopters were enrolled in this study.*

Intervention : *Bilateral medial rectus recessions of 7-9 millimeters were performed in these patients.*

Results : *Postoperatively, 27 of the 42 patients (64.3%) were aligned within ± 10 prism diopters of orthophoria. Thirteen patients (31%) had residual esotropia. Two patients (4.7%) developed consecutive exotropia. Seven patients were noted to have slight decrease in convergence, and only one patient had mild adduction deficit.*

* Department of Ophthalmology, Faculty of Medicine, Chulalongkorn University

Conclusion : *This study shows that bilateral medial rectus recessions in excess of the standard maximum 5 mm in large angle congenital esotropia can have a favorable outcome. In spite of only two muscles being operated on, patients can obtain good ocular alignment, leaving the lateral rectus muscles being unoperated for future surgery if necessary.*

Key words : *Congenital esotropia, Medial rectus recession.*

Reprint request : Yaisawang S, Department of Ophthalmology, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

Received for publication : January 10,1997.

สุดารัตน์ ใหญ่สว่าง. การผ่าตัดหย่อนกล้ามเนื้อมีเดียลเร็คตัสทั้งสองตา ในการรักษาตาเหล่เข้าที่เป็นมาแต่กำเนิดชนิดที่มีมุมเหล่กว้าง. จุฬาลงกรณ์เวชสาร 2540 เม.ย;41(4): 253-63

วัตถุประสงค์ : *เพื่อศึกษาและรายงานผลการผ่าตัดหย่อนกล้ามเนื้อมีเดียลเร็คตัสทั้งสองตา โดยทำผ่าตัดในขนาดที่มากกว่าปกติ ในกลุ่มผู้ป่วยตาเหล่เข้าที่เป็นมาแต่กำเนิดชนิดที่มีมุมเหล่กว้าง*

สถานที่ทำการศึกษา : *คลีนิคโรคตาเหล่ ภาควิชาจักษุวิทยา คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย*

รูปแบบการวิจัย : *การศึกษาไปข้างหน้าทางคลีนิค*

ผู้ป่วยที่ได้ทำการศึกษา : *การศึกษานี้ได้ทำการคัดเลือกผู้ป่วยจำนวน 42 ราย ซึ่งมีตาเหล่เข้าที่เป็นมาแต่กำเนิด ชนิดที่มีมุมเหล่กว้าง 50-90 ปริซึมไดออพเตอร์*

วิธีการศึกษา-วัดผล : *ทำโดยการผ่าตัดหย่อนกล้ามเนื้อมีเดียลเร็คตัสทั้งสองตา ในขนาด 7-9 มิลลิเมตร ซึ่งเป็นขนาดที่มากกว่าปกติ ในผู้ป่วยกลุ่มดังกล่าว*

ผลการศึกษา : *หลังการผ่าตัด ผู้ป่วย 27 ราย จากจำนวนทั้งหมด 42 ราย (64.3%) มีตาตรงในขนาดที่น่าพอใจ (=0±10 ปริซึมไดออพเตอร์) ผู้ป่วย 13 ราย (31%) ยังมีตาเหล่เข้าเหลืออยู่ ผู้ป่วย 2 ราย (4.7%) มีตาเหล่ออก นอกจากนี้ยังพบว่าคอนเวอเจ้นซ์ลดลงเพียงเล็กน้อยในผู้ป่วย 7 ราย และการกลอกตาเข้าด้านในลดลงเล็กน้อยในผู้ป่วยรายเดียว*

วิจารณ์และสรุป : *ผลของการศึกษานี้พบว่าการผ่าตัดหย่อนกล้ามเนื้อมีเดียลเร็คตัสทั้งสองตา ในขนาดที่มากกว่า 5 มิลลิเมตร ซึ่งเป็นขนาดมาตรฐานให้ผลดีเป็นที่น่าพอใจในผู้ป่วยตาเหล่เข้าที่เป็นมาแต่กำเนิดชนิดที่มีมุมเหล่กว้าง ผู้ป่วยมีตาตรงจากการผ่าตัดกล้ามเนื้อตาเพียงสองมัด และยังมีกล้ามเนื้อแลทเทอรัลเร็คตัสเหลืออีกสองมัดสำหรับการผ่าตัดครั้งต่อไป ถ้าจำเป็น*

Congenital or infantile esotropia is the most common type of strabismus occurring in infancy. It is characterized by a large angle esotropia (50 prism diopters or more) that is constantly manifest and occurs before 6 months of age. It is frequently associated with cross fixation, oblique muscle dysfunction, dissociated vertical deviation and latent nystagmus.[1-3] The treatment of congenital esotropia is usually surgical, after correction of significant hyperopic refractive erross and amblyopia prior to surgery[4] angle esotropia,[6,7] and augmented or en bloc recession which consists of bilateral medial rectus recessions combined with conjunctival and Tenon's capsule recession.[8,9]

The symmetrical surgical procedure, bilateral medial rectus recessions, is the surgical approach used for most patients with congenital esotropia.[10] Recession is technically easier and faster than resection.[11] Because there is less tension when the suture is tied, there is less chance of the muscle slipping free from its attachment. Bleeding from the tendinous portion of the muscle where it is cut from the globe in recession is less than that from the cut end of the muscle belly in resection. Furthermore, recession tends to have a more pleasing cosmetic appearance postoperatively than resection, in which the overlying subconjunctival tissue sometimes has a salmon-pink, fleshy, thickened appearance that is easily visible in the interpalpebral fissure.

In large angle congenital esotropia, the uniform surgery, in which surgery is restricted to two muscles (bilateral medial rectus recessions or monocular recession-resection) has resulted in a higher percentage of undercorrection than the selective surgery, in which bilateral medial rectus recessions are combined with resections of one or both lateral rectus.[7,12] Conventionally, the standard maximum recession of the medial rectus muscle has been approximately 5 mm, therefore it is insufficient to correct large angle esotropia when using the uniform surgery. It is generally felt that medial rectus recession in excess of that amount would in some way cripple the rotational effect of the muscle and lead to adduction deficiency, convergence weakness and consecutive exotropia due to medial rectus underaction. But recently, several authors have advocated that bilateral medial rectus recessions in excess of the standard 5 mm can be used for the correction of large angle congenital esotropia and with a higher success rate.[13-17] Those authors have concluded that this is a safe and effective method in the management of large angle congenital esotropia.

The purpose of this paper is to report the surgical results in a group of congenital esotropic patients with a deviation of 50 prism diopters or greater who underwent 7-9 mm bilateral medial rectus recessions.

Materials and Methods

Forty-two patients with congenital esotropia were enrolled in this study from September 1992 to December 1996. The eligibility criteria were: 1) Esotropia was known to be present before 6

months of age from a history obtained from the parents or from examination by an ophthalmologist; 2) Preoperative deviation of 50 prism diopters orgreater; 3) Amblyopia was treated; and 4) Alternate fixation. Patients were excluded who had undergone previous muscle surgery, or who were unavailable for follow-up for a minimum of six weeks following surgery.

Before surgery, all patients received cycloplegic refraction. Hyperopia greater than 2.0 diopters was corrected with glasses. Amblyopia was treated by full-time occlusion therapy until the visual acuity of two eyes was less than two lines difference or until there was alternation of fixation.

Preoperative and postoperative measurements of deviation were estimated based on the prism and cover test with the patients fixating on a target at 0.3 m (near), and at 6 m (distance). When this was impossible in very young patients, thus measurements were based on the Hirschberg test and/or Krimsky test.

Convergence and adduction were examined before and after surgery. Convergence was decreased when the near point of convergence was as remote as 10 cm or more.[18] Adduction was graded as follows: ability to bury nasal limbus with maximal adduction = normal; for each 1 mm of nasal scleral show on attempted adduction a score of -1 was given, eg. 1 mm of show = -1, 2 mm of show = -2, 3 mm of show = -3.

The Surgical Technique

All patients were operated on by the author. Bilateral medial rectus recessions of 7 to 9 mm were performed using a limbal incision or a fornix (cul-de-sac) approach. The recession was measured from the muscle insertion. In most of the cases, the muscle was sutured directly on the sclera at the site of the proposed amount of recession as in conventional recession. In some cases for which a very large recession was planned, it was technically difficult to achieve adequate exposure. The partial hang-back, modified from the hang-back technique,[19,20] was used in these cases. The sutures were passed through the sclera as far as possible, and the loose muscle was pulled up snugly against the sclera. The sutures were clamped with a needle holder at the site equal to the remaining amount of recession. After the knots were tied and trimmed, the muscle was then allowed to fall back from the new insertion. Finally, the desired amount of recession was confirmed with calipers prior to closure of the conjunctiva. The conjunctiva was not recessed. In patients in whom the inferior oblique overaction was noted preoperatively, myectomy of the inferior oblique was performed at the time of the initial procedure.

Results

Forty-two patients with congenital esotropia who underwent 7 to 9 mm bilateral medial rectus recessions were prospectively studied. Age

at the time of initial surgery ranged from 1 year to 33 years with a mean age of 8.2 years. Twenty-nine female (69%) and 13 male (31%) patients were included in the study. Postoperative follow-up time ranged from 1.5 months to 52 months with a mean of 20.4 months (Table 1).

Table 1. Patient data.

Patient No.	Age at Surgery (yrs)	Preop Deviation (prism diopters)	BMR Recessions (mm)	Postop alignment at last exam of the 1st operation	Add	Conv	Length of F.U. (mos)	Comments
1	3	60	7	XT=15	N	N	51	Recurrent amb OS
2	7	60	7	S	N	N	1.5	Lost F.U.
3	19	60	7	ET=15	N	slight D	52	
4	18	80	8	ET=20	N	N	18	Reop
5	3	50	7	S	N	N	28	
6	19	50	7	S	N	Slight D	50	
7	2	80	8	ET=15	N	N	2	Lost F.U.
8	9	80	8	ET=30	N	N	1.5	Lost F.U.
9	33	60	7.5	S	-1	Slight D	3	
10	2	60	7	S	N	N	49	
11	15	85	8	ET=20	N	N	47	
12	20	80	8	S	N	Slight D	45	
13	1.5	60	7	S	N	N	9	
14	1	60	8	ET=20	N	N	29	Recurrent amb OD; Reop
15	26	60	8	S	N	N	1.5	Lost F.U.
16	2	60	7.5	S	N	N	42	
17	4.5	60	8	S	N	N	14	
18	2	60	7.5	S	N	N	43	
19	1.5	60	7.5	ET=35	N	N	27	Recurrent amb OS; Reop
20	4	60	8	S	N	N	6	
21	18	90	9	ET=30	N	Slight D	33	Reop
22	4	75	8.5	S	N	N	10	
23	4.5	60	8	S	N	N	5	
24	17	60	8	S	N	Slight D	37	
25	3.5	60	8	S	N	N	1.5	Lost F.U.
26	1.5	60	8	ET=25	N	N	36	Recurrent amb OD; Reop
27	3	60	8	S	N	N	7	
28	5	60	8	ET=30	N	N	3	Reop
29	1	60	8	ET=30	N	N	32	Reop
30	24	75	8.5	ET=40	N	Slight D	31	Reop
31	2	90	9	S	N	N	13	
32	5	60	8	S	N	N	24	
33	2	60	8	S	N	N	1.5	Lost F.U.
34	1.5	60	8	S	N	N	29	
35	1	60	8	S	N	N	26	
36	5.5	75	8.5	S	N	N	3	
37	10	50	7	S	N	N	16	
38	1.5	70	8.5	S	N	N	8	
39	1.5	70	8.5	S	N	N	8	
40	7	50	7	XT=20	N	N	3	Lost F.U.
41	31	60	8	ET=20	N	N	7	Reop
42	4	70	8	S	N	N		

ET = Esotropia, XT = Exotropia, S = Successful alignment, Add = Adduction, Conv = Convergence, N = Normal, D = Decrease, F.U. = Follow Up, Amb = Amblyopia, Reop = Reoperation

The patients were divided into three groups according to the preoperative deviations and surgical managements (Table 2). Twenty-nine patients had deviations in the 50 to 60 prism diopters range and underwent bilateral medial rectus recessions of 7.0 to 8.0 mm. Eleven patients had deviations of 70 to 85 prism diopters and had bilateral medial rectus recessions of 8.0 to 8.5 mm. The remaining 2 patients had 90 prism diopters esotropia and had bilateral medial rectus recessions of 9 mm.

Table 2. Group of patients according to preop deviation and surgical management.

Group	Number of Patients	Preop Deviation (prism diopters)	BMR Recessions (mm)	% of Successful Alignment
I	29	50-60	7.0-8.0	69%
II	11	70-85	8.0-8.5	54.5%
III	2	90	9.0	50%

Successful horizontal alignment was defined as within ±10 prism diopters of orthophoria at near or distance.[4] The postoperative horizontal alignment, adduction and convergence were assessed at the patients final follow-up after the initial surgical procedure.

Analysis of the postoperative deviation in the primary position (Tables 1 & 2) shows that 20 of the 29 patients in group I (69%) were successfully treated. In group II, 6 of the 11 patients (54.5%) were aligned. And 1 of the 2 patients in group III (50%) had a successful outcome. Overall, 27 patients (64.3%) of the three groups combined were successfully treated. Thirteen patients (31%) had residual esotropia, and 8 patients required a second operation. Two patients (4.7%) in this study developed consecutive exotropia. In addition, 7 patients were noted to have a slight decrease in convergence, and only 1 patient had mild adduction deficit (graded-1).

Discussion

It was generally accepted that the standard maximum recession of the medial rectus muscle was approximately 5 mm.[21] The concept that this maximum amount of recession should not be exeeded was due to the belief that doing so would put the new insertion of the muscle posterior to the equator of the globe.[22] Beisner[23] demonstrated that excessive recession crippled the medial rectus muscle because of a loss of contractile force due to shortening of the muscles length. In his study, Beisner also presented a mathematical analysis that bilateral medial rectus recessions of 8 mm appeared feasible since a loss of only 10% in torque occurred when the eye was adducted 15°. Clinically, this

amount of medial rectus recession might result in underaction of the muscle and lead to adduction and convergence deficits. However, this causes no problem[13] since the practical limits of ocular motility are less than 20° to either side of the primary position. Beyond that, rotation of the head brings the object of regard into the primary position. In convergence, little medial rectus function is needed, therefore the residual function of each medial rectus is adequate for usual near work.

Greenwald[24] pointed out that usually no significant limitation of adduction was observed following large medial rectus recession because continued overcontraction of the muscle due to its underlying innervational disturbance overcame the resulting muscle underaction. Helveston[25] stated that even when the medial rectus was recessed behind the point of tangency, attachments to the intermuscular membrane, which attached to the globe well anterior to the point of tangency, could mediate adduction. The lever arm was reduced, but adducting power remained. An extreme example was the case of free tenotomy performed with minimal dissection of the adjacent intermuscular membrane in which some adduction was present posto-peratively.

Hess and Calhoun[13] were the early advocates of large bilateral medial rectus recessions. The amount of recession in their study was 6-8 mm from the insertion with an overall success rate of 73%. This figure compared quite favorably with the success rates of other reports of patients receiving initial surgery for correction of large angle esotropia.[26] Otherwise, the incidence of weakness of adduction and convergence was very low. They concluded that it was permissable and safe to exceed the traditional 5 mm recession of the medial rectus.

In this series, 27 patients (64.3 %) obtained a satisfactory result. Patients in group I had better success rates compared to the patients in groups II and III which had larger preoperative deviations. Bateman and co-workers [27] used computer-based stepwise discriminant analysis to study the results of congenital esotropia surgery. They found that the smaller the preoperative deviation and the larger the recession of medial rectus, the greater the chances for a successful outcome. In the congenital esotropia patient, the larger the preoperative deviation, the more difficulty there will be in achieving ocular alignment in the first operation. The higher incidence of failures in the group II and III patients in this series suggests that perhaps three muscle surgery or augmented bilateral medial rectus recessions may be more appropriate in patient with 70-90 prism diopters deviation.

Stager and associates[28] reported a 27% rate of delayed consecutive exotropia after bilateral 7-mm medial rectus recessions which was a higher rate than previously reported. While in this study, many more undercorrections (31%) were found than overcorrections (4.7%) even in long term follow-up. It was also noticed that all four patients

with recurrent amblyopia had unsatisfactory outcomes; 3 patients had residual esotropia and one patient had consecutive exotropia.

Minimal convergence and adduction deficits were noted in 8 patients and were not considered to be clinically significant. The degree of limitations seen were less than one would predict on theoretical grounds.

The surgical procedure in large medial rectus recession might be difficult to perform, particularly in very young children due to the relatively small size of the globe. In these cases, the partial hang-back technique was utilized, as already described.

Excessive muscle recession may bring the muscle to the point of slackness. The muscle length tension curve does not follow a linear pattern, the more a muscle is slackened, the greater the weakening effect of further slackening.[24,29] When performing a large medial rectus recession, the surgical result can be unpredictable. The surgeon must be very careful as even small measurement errors may result in significant overcorrection or undercorrection.

In summary, the goals in treating this entity are appropriate and rational outcomes. The patients should end up with good vision, a cosmetically acceptable appearance, and fewer total eye muscle surgeries. I therefore recommend large bilateral medial rectus recessions as the initial surgical management for this entity.

References

1. Costenbader FD. Infantile esotropia. Trans Am Ophthalmol Soc 1961; 59:397-429
2. Romano PE. Congenital esotropia: definition, course, and management. J Pediatr Ophthalmol 1971 May; 8(2):88-92
3. von Noorden GK. A reassessment of infantile esotropia. XLIV Edward Jackson memorial lecture. Am J Ophthalmol 1988 Jan; 105(1):1-10
4. Taylor DM. Congenital strabismus: The common senseapproach. Arch Ophthalmol 1967 Apr;77(4):478-84
5. von Noorden GK, Isaza A, Parks ME. Surgical treatment of congenital esotropia. Trans Am Acad Ophthalmol Otolaryngol 1972 Nov-Dec;76(6): 1465-78
6. Lee DA, Dyer JA. Bilateral medial rectus muscle recession and lateral rectus muscle resection in the treatment of congenital esotropia. Am J Ophthalmol 1983 Apr; 95(4):528-35
7. Scott WE, Reese PD, Hirsh CR, Flabetich CA. Surgery for large-angle congenital esotropia: Two vs three and four horizontal muscles. Arch Ophthalmol 1986 Mar; 104(3):374-7
8. Helveston EM, Ellis FD, Patterson JH, Weber J. Augmented recession of the medial recti. Ophthalmology 1978 May; 85(5):507-11

9. Willshaw HE, Mashhoudi N, Powell S. Augmented medial rectus recession in the management of esotropia. Br J Ophthalmol 1986 Sep; 70(9):840-3

10. Wright KW. Esotropia. In: Wright KW, Buckley EG, Del Monte MA, Ellis FD, Ellis GS Jr, Mets MB, Stone EM, eds. Pediatrics Ophthalmology and Strabismus. St. Louis: Mosby, 1995:179-94

11. Calhoun JH, Nelson LB, Harley RD. Atlas of Pediatric Ophthalmic Surgery. Philadelphia: W. B. Saunders, 1987:1-21

12. Foster RS, Paul TO, Jampolsky A. Management of infantile esotropia. Am J Ophthalmol 1976 Aug;82(2):291-9

13. Hess JB, Calhoun JH. A new rationale for the management of large angle esotropia. J Pediatr Ophthalmol Strabismus 1978 Nov-Dec;16(6):345-8

14. Prieto-Diaz J. Large bilateral medial rectus recession in early esotropia with bilateral limitation of abduction. J Pediatr Ophthalmol Strabismus 1980 Mar-Apr;17(2): 101-5

15. Szmyd SM, Nelson LB, Calhoun JH, Spratt C. Large bimedial rectus recessions in congenital esotropia. Br J Ophthalmol 1985 Apr;69(4):271-4

16. Nelson LB, Calhoun JH, Simon JW, Wilson T, Harley RD. Surgical management of large angle congenital esotropia. Br J Ophthalmol 1987 May;71(5):380-3

17. Weakley DR Jr, Stager DR, Everett ME. Seven-millimeter bilateral medial rectus recessions in infantile esotropia. J Pediatr Ophthalmol Strabismus 1991 Mar-Apr; 28(2):113-5

18. Tyler LL, Cassin B. Non-asthenopic convergence insufficiencies. Am Orthopt J 1989 Jan-Dec;39(1):102-5

19. Repka MX, Guyton DL. Comparison of hang-back medial rectus with conventional recession. Ophthalmology 1988 Jun;95(6):782-7

20. Potter WS, Nelson LB, Handa JT. Hemi-hang-back recession: description of the technique and review of the literature. Ophthalmic Surg 1990 Oct;21(10):711-5

21. Bartley GB, Dyer JA, Ilstrup DM. Characteristics of recession-resection and bimedial recession for childhood esotropia. Arch Ophthalmol 1985 Feb;103(2):190-5

22. Helveston EM. 19th annual Frank Costenbader lecture the origins of congenital esotropia. J Pediatr Ophthalmol Strabismus 1993 Jul-Aug;30(4):215-32

23. Beisner DH. Reduction of ocular torque by medial rectus recession. Arch Ophthalmol 1971 Jan;85(1):13-7

24. Greenwald MJ. Surgical management of essential esotropia. Ophthalmol Clin North Am 1992 Mar;5(1):9-22

25. Helveston EM. Surgical Management of Strabismus: An Atlas of Strabismus Sur-

gery. 4th ed. St. Louis: Mosby, 1993: 143-71

26. Nelson LB, Wagner RS, Simon JW, Harley RD. Congenital esotropia. Surv Ophthalmol 1987 May-Jun;31(6):363-83

27. Bateman JB, Parks MM, Wheeler N. Discriminant analysis of congenital esotropia surgery: Predictor variables for short and longtermoutcomes Ophthalmology 1983 Oct;90(10):1146-53

28. Stager DR, Weakley DR Jr, Everett M, Birch EE. Delayed consecutive exotropia following 7-millimeter bilateral medial rectus recession for congenital esotropia. J Pediatr Ophthalmol Strabismus 1994 May-Jun;31(3):147-52

29. Wright KW. Anatomy and physiology of the extraocular muscles. In: Wright KW, Buckley EG, Del Monte MA, Ellis FD, Ellis GS Jr, Mets MB, Stone EM, eds. Pediatrics Ophthalmology and Strabismus. St. Louis: Mosby, 1995: 89-101