The Surgical Outcome of Inferior Oblique Recession on Bilateral Superior Oblique Palsy in Children†

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Objective: *To study the surgical effects of bilateral graded inferior oblique muscle (IO) recession on the reduction of the V pattern deviation and severity of inferior oblique muscle overaction (IOOA) in children who had bilateral superior oblique muscle palsies(SOP) with secondary inferior oblique muscle overaction.*
Material and Method: *Seven patients who presented with bilateral SOP with secondary IOOA were included. All patients had V pattern deviation and bilateral graded IO recession was done. The data of age, sex, deviation in primary position, V pattern and severity of IOOA was recorded both pre- and post -operatively. The comparison of pre-operative and post-operative amount of V pattern and IOOA was analyzed with non-parametric statistical_analysis.*
Results: *Four females and three males had the average age of 5.7 ± 1.8 years old. The mean pre-operative severity of IOOA was + 3 and the mean pre-operative deviation of the V pattern was 36 ± 11.4 prism diopters (PD). The mean post-operative severity of IOOA was + 0.4 and of V pattern deviation was 10.7 ± 4.4 PD. Comparing the pre-operative and post-operative severity of IOOA and V pattern deviation by non-parametric statistical analysis and the result was statistically significant.*
Conclusion: *Bilateral graded IO recession is an effective surgical procedure to reduce the V pattern and the severity of IOOA in the children who are suffering from bilateral SOP with secondary IOOA.*

Keywords: *Eye movements, Oculomotor muscles, Bilateral superior oblique palsy, V pattern, Inferior oblique recession*

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Superior oblique palsy (SOP) is the most common cyclovertical muscle palsy. In unilateral SOP, the patients present with head tilt opposite to the paralyzed eye, hypertropia in the paralyzed eye, increased vertical deviation upon adduction, and increased vertical deviation upon head tilt to the ipsilateral side. However, in bilateral SOP, the patients have small vertical deviation in the primary position, head tilt is not the presenting symptom and the patients show overelevation of either eye on adduction, which is caused by the bilateral secondary inferior oblique overaction (IOOA).The characteristics of bilateral SOP include small vertical deviation in primary position, alternating hypertropia at right and left gaze, presence of hypertropia on head tilt in either side, large degree of excyclotorsion, V pattern esotropia in downgaze, and underaction of both superior oblique muscles (SO) on duction.

There are many options of surgical managements for bilateral SOP with V pattern as bilateral SO muscles tucking, bilateral inferior rectus muscles recession, bilateral medial rectus muscles infraplacement and bilateral inferior oblique (IO) weakening including recession, myectomy, myotomy, or disinsertion. However, the recommended procedure is bilateral SO

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tucking[3,7] or bilateral SO tucking plus bilateral IO recession[4], which is better than bilateral IO recession alone.

In the aspect of IO recession, this surgical technique is an easy operation, no post-operative complication of abnormal lid position or muscle restriction. Therefore, the study is concentrated in the surgical effect of bilateral graded IO recession in the children with the bilateral SOP accompanied by secondary IOOA on the reduction of the V pattern and IOOA severity.

Material and Method

Seven patients in the muscle clinic, Queen Sirikit National Institute of Child Health who had bilateral SOP with secondary IOOA were included between April 1, 2007 and September 30, 2007. The criteria for the diagnosis of bilateral SOP consisted of the evidence of a SOP by three-step test[8], alternating hypertropia at right and left gaze, presence of hypertropia on head tilt in either side,V pattern esotropia in downgaze, and underaction of both SO muscles on duction. The severity of IOOA and SO underaction (SOUA) before and after surgery was graded. This was done by recording the difference between the corneal limbus height in each eye according to the degree of over-elevation of the eye in adduction for IOOA and of underaction of the eye in adduction for SOUA. The over-elevation and the underaction scale ranged from 0 to +4 for IOOA (Fig. 1) and 0 to -4 for SOUA (Fig. 2) respectively.

In the aspect of deviation in the primary position, the measurement was performed by prism cover test at distance (6meters) and at near (33 centimeters). For V pattern deviation, prism cover test and photograph of the eye movement in the primary position, as well as upgaze and downgaze at distance was recorded. However, if the patients were not co-operative, the Hirschberg test was performed.

Considering the surgical technique, an inferotemporal cojunctival forniceal incision was made. The conjunctiva and tenons were open separately in layers. The IO muscle was identified and hooked under direct vision. The IO muscle was cleared of its surrounding intermuscular septa. A double-armed 6-0 vicryl suture was passed through the muscle with lock-bite at either side, and then the IO muscle was disinserted from the globe between the suture and its insertion.

The amount of recession was titrated according to the degree of IOOA severity. In +2 severity of IOOA, a 10 millimeters recession was done with the needle site entering from the anterior border of the disinserted muscle at the sclera 3 millimeters posteriorly and 2 millimeters temporally to the lateral border of the inferior rectus muscle insertion. For +3 to +4 severity of IOOA, the surgery required a 14 millimeters recession

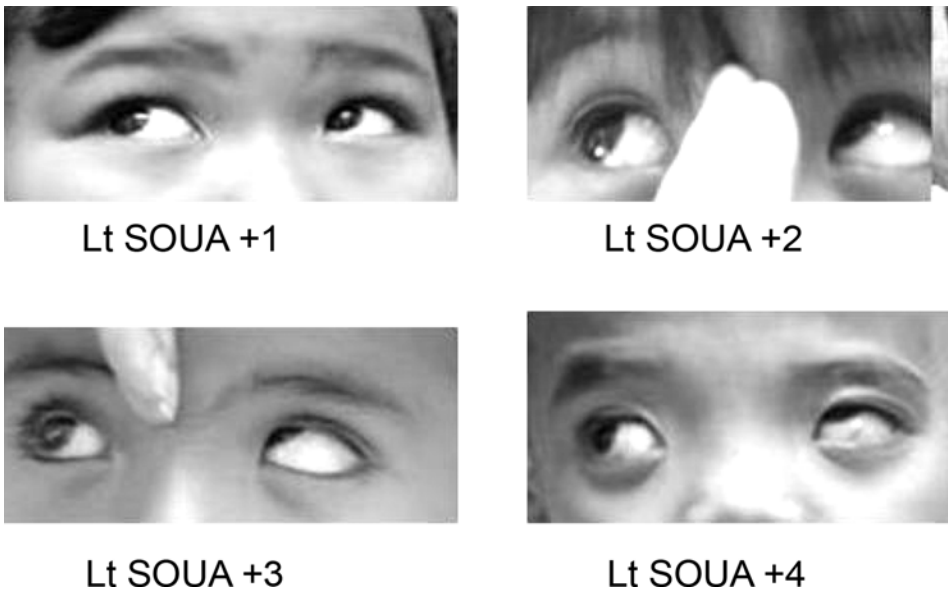

Fig. 1 Shows grading of inferior oblique overaction (IOOA = inferior oblique overaction; RT = right; LT = left)

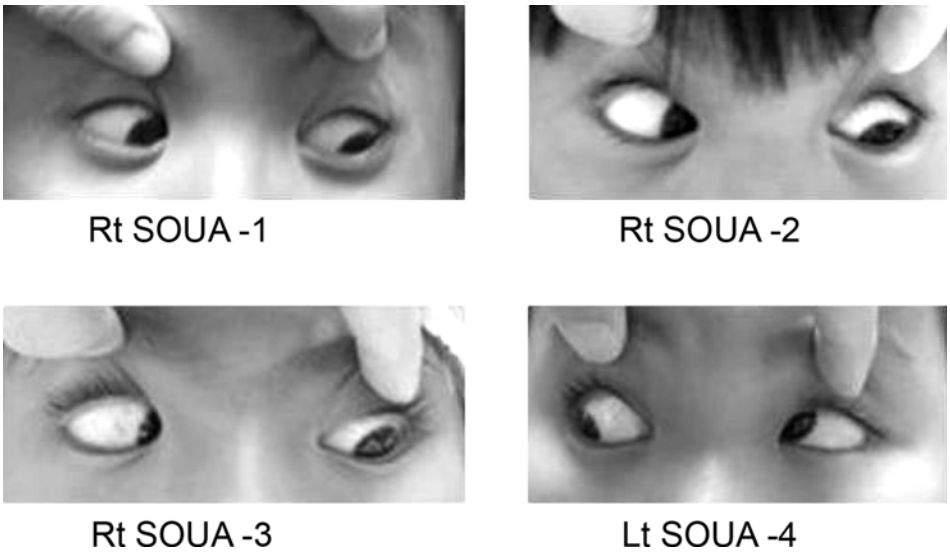

Fig. 2 Shows grading of superior oblique underaction. (SOUA = superior oblique underaction; RT = right; LT = left)

with the needle site was in front of the exit of the vortex vein or 8 millimeters posteriorly to the lateral border of the inferior rectus muscle insertion. Furthermore, the surgical correction of the deviation in primary position was done in the same operation and then the conjunctiva and tenons were closed in separate layers using interrupted 8-0 vicryl suture.

The authors recorded the age of the patients, the fundus findings, the deviation in the primary position, and the pre-operative and post-operative data of the amount of V pattern, the severity of IOOA, and SOUA by using Wilcoxon sign-rank test at significance level $p < 0.05$.

Results

Seven patients with four females and three males had the mean age of 5.7 $\pm$ 1.8 years old. All patients had normal fundi. Most of the pattern of deviation in the primary position was esotropia (Table 1). The mean pre-operative deviation of V pattern was 36.4 $\pm$ 11.4PD, the mean severity of pre-operative IOOA was +3.14 (+2 to +4), and of SOUA was -2.5 (-2 to -4) (table 1). Postoperatively, the mean deviation of V pattern was 10.7 $\pm$ 4.4 PD, the mean

Table 1. Shows the pre-operative measurements of the patients

No.	Deviation in primary position (PD)	Bielschowsky head tilt test	Pre-operative V pattern (PD)	Pre-operative IOOA		Pre-operative SOUA	
				RE	LE	RE	LE
1	ET 30	-	50	+2	+4	-2	-3
2	ET 18	Positive to RT > LT	35	+3	+2	-2	-2
3	ET 65	Positive to RT > LT	50	+3	+3	-3	-3
4	ET 65	Positive to RT > LT	40	+3	+3	-2	-2
5	RDVD 12 with RHT 8	Positive to RT	25	+4	+4	-2	-2
6	ET 12 with RDVD	Positive to RT	20	+4	+4	-3	-3
7	ET 45	Positive to RT > LT	35	+3	+2	-3	-3

ET = esotropia; RDVD = right dissociated vertical deviation; RHT = right hypertropia; PD = prism diopters; RT = right side; LT = left side; RE = right eye; LE = left eye; IOOA = inferior oblique overaction; SOUA = superior oblique underaction

severity of IOOA was +0.43(0 to +2), and of SOUA was -0.57 (0 to -2) (Table 2). All patients underwent muscle correction to treat the deviation in the primary position at the same session of bilateral IO recession (Table 3). When comparing the pre-operative and post-operative V pattern and the severity of IOOA with the non-parametric test, the results were statistically significant. Furthermore, the mean severity of SOUA was also reduced from -2.5 to -0.57(Fig. 3, 4).

Discussion

From the results, the bilateral graded IO recession was an impressive surgery to decrease V pattern in bilateral SOP with secondary IOOA i.e. it reduced 66% of the pre-operative deviation of V pattern. Moreover, this procedure prominently reduced the severity of IOOA and improved the clinical SOUA.

The clinical features of bilateral SOP, although the patients usually presented with no vertical deviation in the primary position, the patients had findings of left hyperdeviation in right gaze, right hyperdeviation in left gaze, right hypertropia on right head tilt, left hypertropia on left head tilt, large degree of excyclotorsion, and V pattern[1,2,6]. Because of the age and co-operation of patients in the present study, excyclotorsion testing was not done. However, the diagnosis of bilateral SOP was done by the evidence of three-step test and V pattern deviation.

Various surgical methods were reported to treat bilateral SOP with V pattern as the followings bilateral SO tucking[3,4,7], bilateral inferior rectus muscle recession[2,3], bilateral medial rectus muscle infraplacement[2,4] and bilateral IO weakening[2,3,4,5]. However, a study recommended bilateral IO recession

Table 2. Shows the post-operative measurements of the patients

No.	Deviation in primary position (PD)	Post-operative V pattern (PD)	Post-operative IOOA		Post-operative SOUA	
			RE	LE	RE	LE
1	Orthotropia	12	0	0	0	-1
2	Orthotropia	12	+1	0	-1	0
3	Orthotropia	4	0	0	0	0
4	ET 8	7	0	+1	0	0
5	Orthotropia	18	0	0	0	0
6	Orthotropia	10	+2	+1	-2	-2
7	ET 5	12	+1	0	-1	-1

ET = esotropia; RE = right eye; LE = left eye; IOOA = inferior oblique overaction; SOUA = superior oblique underaction; PD = prism diopters

Table 3. Shows the surgical procedure of the patients

No.	Pre-operative deviation in primary position	Surgery
1	ET 30 PD	BMR recess 4.5 mm RIO recess 10 mm LIO recess 14 mm
2	ET18 PD	RMR recess 4.5 mm BIO recess 14 mm
3	ET 65PD	BMR recess 6.5 mm BIO recess 14 mm
4	ET 65 PD	BMR recess 6.5 mm BIO recess 14 mm
5	RDVD 12 PD with RHT 8 PD	RSR recess 3.0 mm + Faden 15 mm from limbus, BIO recession 14 mm
6	ET 12 PD with RDVD	BIO recess 14 mm
7	ET 45 PD	BMR recess 5.5 mm RIO recess 14 mm LIO recess 10 mm

ET = esotropia; RDVD = right dissociated vertical deviation; RHT = right hypertropia; PD = prism diopters; BMR = bilateral medial rectus; RIO = right inferior oblique; LIO = left inferior oblique; RMR = right medial rectus recession; BIO = bilateral inferior oblique; RSR = right superior rectus

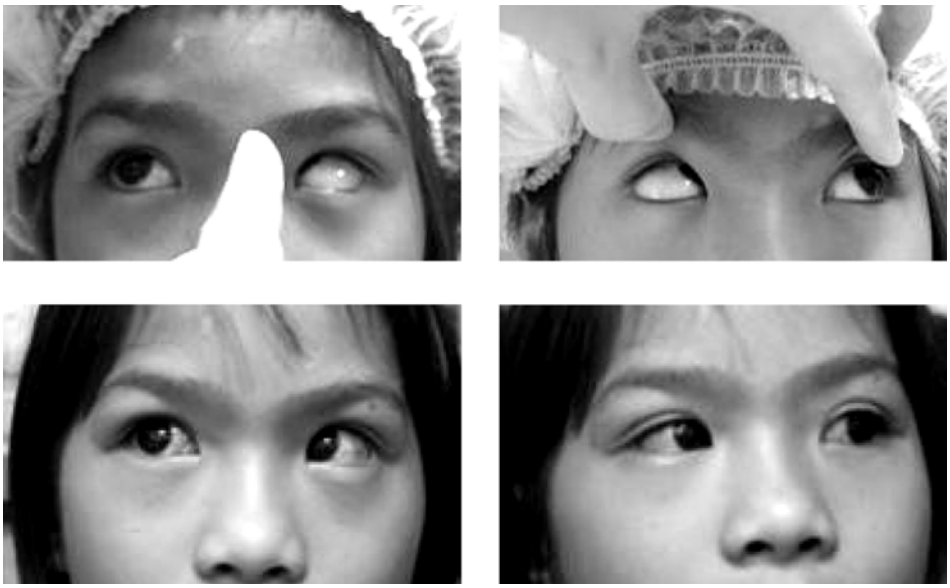

Fig. 3 Shows pre-operative (upper) and post-operative (lower) severity of IOOA in case 3 (IOOA = inferior oblique overaction)

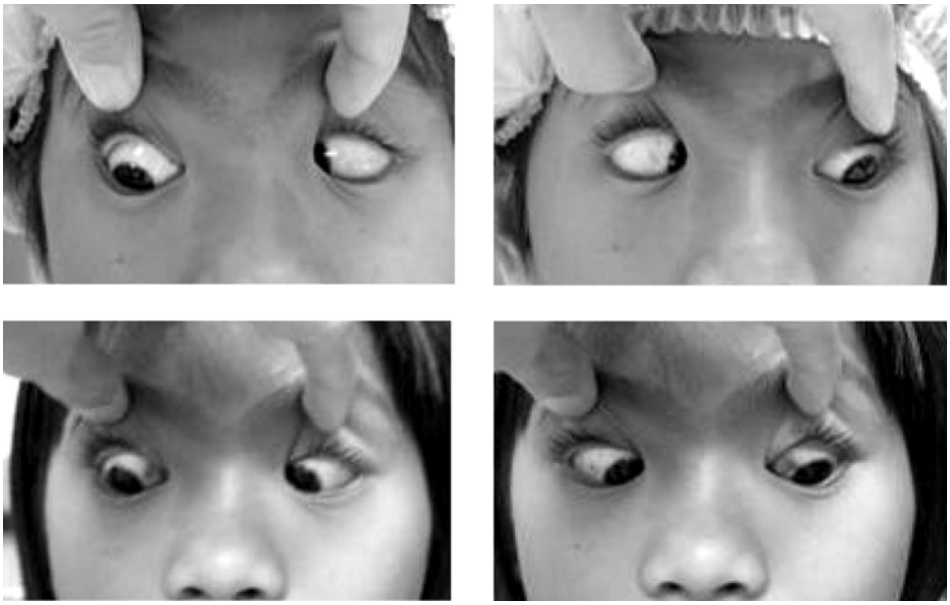

Fig. 4 Shows pre-operative (upper) and post-operative (lower) severity of SOUA in case 3 (SOUA = superior oblique underaction)

in the patients with asymmetrical SOP, small hyperdeviation in the primary position, V- pattern esotropia and IOOA[4]. In the present study, all patients had bilateral SOP with secondary IOOA, V-pattern esotropia and no or small hyperdeviation in the primary position. Therefore, the surgical technique of bilateral IO weakening by graded IO recession was selected due to ease of the procedure and the low risk of the surgical

technique. The surgeon could titrate the amounts of recession as the degree of IOOA or repeat the operation and avoid iatrogenic Brown syndrome from SO tucking.

Even though surgical results were good, the present study was not a comparative clinical research and had a small sample size with short follow up. Therefore, further long-term observation and a larger study is required.

In summary, bilateral graded IO recession is an effective procedure to correct V pattern and reduce IOOA from bilateral SOP with secondary IOOA in children.

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การศึกษาผลการผ่าตัดกล้ามเนื้อตาด้วยวิธี inferior oblique muscle recession ในผู้ป่วยเด็กที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา

พัชรพิมพ์ มัศยาอานนท์, ไอรีน ศุภางคเสน, จุฑาทิพย์ หิริโอตัปปะ

วัตถุประสงค์: *เพื่อศึกษาผลการผ่าตัดกล้ามเนื้อตาด้วยวิธี inferior oblique muscle recession ที่มีต่อการลดภาวะ V pattern และ inferior oblique overaction ซึ่งพบในผู้ป่วยที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา และมีภาวะ secondary inferior oblique overactionร่วมด้วย*

วัสดุและวิธีการ: *เก็บรวบรวมข้อมูลผู้ป่วยเด็ก7 รายในคลินิกกล้ามเนื้อตาสถาบันสุขภาพเด็กแห่งชาติมหาราชินี ที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา และมีภาวะ secondary inferior oblique overaction ร่วมด้วยทั้ง 2 ตา (1 เมษายน ถึง 30 กันยายน พ.ศ. 2550) ผู้ป่วยทุกรายตรวจพบภาวะ V pattern ก่อนการผ่าตัด และผู้ป่วยได้รับการผ่าตัดด้วยวิธี inferior oblique muscle recession ทำการเก็บข้อมูล อายุ เพศของผู้ป่วย, ชนิดและปริมาณมุมเขในท่าหน้าตรง, ปริมาณของ V pattern และระดับความรุนแรงของ inferior oblique overaction ทั้งก่อนและหลังผ่าตัด แล้วนำข้อมูลที่ได้มาวิเคราะห์เปรียบเทียบโดยใช้สถิติ non-parametric*

ผลการศึกษา: *ผู้ป่วย 7 ราย เป็นชาย 3 ราย หญิง 4 ราย มีอายุเฉลี่ย5.7 ± 1.8ปี ค่าเฉลี่ยของปริมาณ V pattern ก่อนการผ่าตัดคือ 36 ± 11.4 ปริซึมไดออปเตอร์ (PD) และค่าเฉลี่ยของปริมาณ inferior oblique overaction ก่อนการผ่าตัดคือ + 3 ภายหลังการผ่าตัดมีค่าเฉลี่ยของปริมาณ V pattern และปริมาณ inferior oblique overaction เป็น 10.7 ± 4.4 PD และ + 0.4 ตามลำดับ คณะผู้นิพนธ์นำข้อมูลของปริมาณ V pattern และปริมาณ inferior oblique overaction ก่อนและหลังการผ่าตัดมาเปรียบเทียบโดยใช้สถิติ non-parametric ผลการเปรียบเทียบมีความแตกต่างกันอย่างมี นัยสำคัญทางสถิติ*

สรุป: *การผ่าตัดกล้ามเนื้อตาด้วยวิธี inferior oblique muscle recession เป็นวิธีการผ่าตัดที่ได้ผลดีวิธีหนึ่งในการรักษาภาวะ V pattern และ inferior oblique overaction ในผู้ป่วยที่ได้รับการวินิจฉัยเป็น superior oblique palsies 2 ตา*